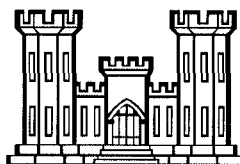




**WORK PLAN**  
**REMEDIAL DESIGN**  
**FINAL**  
**OPERABLE UNIT 1**  
**CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE**  
**SOUTH PLAINFIELD, NEW JERSEY**

**Contract Number W912DQ-05-D-0001**  
**Task Order Number 001**

*Prepared for:*



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**CAPE Project Number 50001.001**  
**October 2005**

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**October 2005**

The following Plan has been prepared in response to a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Record of Decision (ROD) and the signatories below have reviewed and approved the plan for compliance with project requirements.

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10/26/05

Approved by: \_\_\_\_\_  
Michael Lamon  
Cape Environmental  
Project Manager

Date

*Charles Reed*

10/26/05

Approved by: \_\_\_\_\_  
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Date

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1/27/06

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Date

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A	Remedial Investigation Data
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B	Organizational Chart
C	Sampling and Analysis Plan
D	Quality Control Forms
E	Accident Prevention Plan
F	Project Schedule

## LIST OF ABBREVIATIONS AND ACRONYMS

AHA	activity hazard analysis
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
bgs	below ground surface
CDE	Cornell-Dubilier Electronics Corporation, Inc.
CDFR	Chemical Data Final Report
ChQCM	Chemical Quality Control Manager
CHSM	Corporate Health and Safety Manager
CIH	Certified Industrial Hygienist
COR	Contracting Officer's Representative
CQC	Contractor Quality Control
CQCO	Contractor Quality Control Officer
CQCSM	Contractor Quality Control Systems Manager
dBA	decibels on A-weighted scale
DFW	definable feature of work
DQCR	Daily Quality Control Report
EPA	U.S. Environmental Protection Agency
EPP	Environmental Protection Plan
FVR	Field Variance Report
JD	<i>Juris Doctor</i>
mg/kg	milligrams per kilogram
NCR	Nonconformance Report
NDE	nondestructive examination
NJAC	New Jersey Administrative Code
NJ DOT	New Jersey Department of Transportation
OSHA	Occupational Safety and Health Administration
OU	operable unit
PCB	polychlorinated biphenyl
PE	Professional Engineer
PGM	Program Manager
PM	Project Manager
PPE	personal protective equipment
ppm	parts per million
PSE&G	Public Service Electric & Gas
QA	quality assurance
QC	quality control
QCP	Quality Control Plan
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RMS	Resident Management System
ROD	Record of Decision
SAP	Sample and Analysis Plan
SOW	scope of work
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
TO	task order
TSCA	Toxic Substances Control Act
USACE	U.S. Army Corps of Engineers
WVN	Work Variation Notification

## 1.0 INTRODUCTION

This document provides overall guidance for the successful completion of the remedial action at the Cornell-Dubilier Electronics Corporation, Inc. (CDE) Superfund site. Activities described herein are in accordance with the Statement of Work, Contract Number W912DQ-05-D-0001, Contract Task Order (TO) No. 001. This Work Plan applies only to activities performed by CAPE and its subcontractors under the above-referenced contract and TO.

This document is divided into the following sections:

- ▲ Section 1 introduces the document; provides site location, background, and history; discusses the project scope of work (SOW); and discusses site remedial objectives
- ▲ The project organization is provided in Section 2
- ▲ Section 3 discusses the project's general requirements
- ▲ Project activities are discussed in Section 4
- ▲ Section 5 provides the Waste Management Plan
- ▲ The Environmental Protection Plan is presented in Section 6 and the Contractor Quality Control (CQC) Plan is presented in Section 7
- ▲ Section 8 provides project documentation and reporting requirements
- ▲ The project schedule is presented in Section 9
- ▲ References are provided in Section 10.

The attached appendices contain auxiliary document information. This includes the following:

- ▲ Appendix A contains remedial investigation (RI) data
- ▲ Appendix B contains the organizational chart
- ▲ The Sampling and Analysis Plan (SAP) is in Appendix C
- ▲ Appendix D presents the quality control (QC) forms
- ▲ The Site Safety and Health Plan (SSHP) is provided as Attachment C of the Accident Prevention Plan, Appendix E
- ▲ Appendix F contains the project schedule.

### 1.1 Purpose

This Work Plan has been prepared by CAPE to provide overall guidance for the successful completion of fieldwork described in the SOW. It also describes the

coordination activities and sequence of events necessary to ensure the proper and timely completion of work.

## 1.2 Site Location, Background, and History

The CDE site consists of approximately 27 acres located at 333 Hamilton Boulevard in South Plainfield, Middlesex County, New Jersey (Figures 1 and 2). CDE manufactured electronic components, including capacitors, at the site from 1936 to 1962. The site is bordered on the northeast by the Bound Brook and the former Lehigh Valley Railroad, Perth Amboy Branch (presently Conrail); to the southeast by the South Plainfield Department of Public Works property, which includes an unnamed tributary to the Bound Brook; to the southwest, across Spicer Avenue, by single-family residential properties; and to the northwest, across Hamilton Boulevard, by mixed residential and commercial properties.

CDE manufactured electronics components at the site from 1936 through 1962. Polychlorinated biphenyls (PCBs) and chlorinated organic degreasing solvents were used in the manufacturing process. PCBs are a group of chemical compounds consisting of mixtures of numerous chlorinated biphenyl molecules. The compounds differ both in the number and/or position of chlorine atoms attached to the biphenyl rings and in the degree of chlorination for a total of 209 possible individual compounds (i.e., congeners). For commercial purposes, common mixtures of PCBs were given names/identification numbers indicating the degree of chlorination, type of formulation, or other properties. For example, one series of mixtures was named "Aroclor," and the specific mixture was then further distinguished by the percentage of chlorine (e.g., Aroclor-1248 contained 48 percent chlorine).

The following subsections provide a brief discussion of the RI activities performed at the properties selected for remedial action.

### 1.2.1 *Address Redacted*

Twenty samples (and one duplicate) were collected on this property during the RI. Aroclor-1254 was the only PCB compound present, and it was detected in 19 of the sample locations (Figure 3) (Table A-1, Appendix A). Total PCB concentrations ranged from 0.065 milligrams per kilogram (mg/kg) to 6.1 mg/kg (0 to 2 inches below ground surface [bgs]) and from 0.014 mg/kg to 1.2 mg/kg (16 inches to 18 inches bgs). As shown in Appendix A, five samples (RS01-01 through RS01-05) located along Hamilton Boulevard had total PCB concentrations greater than 1 mg/kg (FW, 2001).

### 1.2.2

Seventeen samples were collected on this property during the RI. Total PCB concentrations ranged from a nondetectable concentration to 3.4 mg/kg (0 to 18 inches bgs) (Figure 4). As shown in Appendix A, five samples located at the northern portion of the property along Hamilton Boulevard had Total PCB concentrations greater than 1 mg/kg and one sample located in the southern corner of the property had a Total PCB concentration greater than 1 mg/kg.

### 1.2.3 Address Redacted

Twenty samples were collected on this property during the RI, along with two duplicate samples. During the U.S. Environmental Protection Agency (EPA) Tier III sampling event, one sample (Location A1-002 with a Total PCB concentration of 2.9 mg/kg) was previously collected from northwest of the driveway in the right of way (Figure 5). Aroclor-1254 or Aroclor-1260 was detected in the soils from 15 locations. Total PCB concentrations ranged up to 1.2 mg/kg and 44 mg/kg, respectively, for the 0 to 2-inch bgs and the 16- to 18-inch bgs intervals (Table A-2, Appendix A). Two samples, RS13-17 at 1.2 mg/kg and RS13-19 at 44 mg/kg, had Total PCB concentrations greater than 1 mg/kg, and as shown in Appendix A and Figure 5, both of these samples are located in the northeast portion (i.e., the rear) of the property, which is closest to the CDE site (FW, 2001).

### 1.2.4 Address Redacted

With the exception of location RS18-05, located in the center of the rear portion of the property, all of the samples collected at this property contained detectable levels of Aroclor-1254 (Figure 6) (Table A-3, Appendix A). In the shallow 0 to 2-inch bgs interval, Total PCB concentrations ranged from 0.077 mg/kg to 57 mg/kg. Total PCBs summed up to 310 mg/kg in the 16- to 18-inch bgs samples. As shown in Appendix A and Figure 6, nine samples had Total PCB concentrations greater than 1 mg/kg. These locations were present in the north, northwest, and west along the property boundaries, with the maximum concentration (310 mg/kg) located in the northern corner of the property. This property is located adjacent to the CDE site.

## 1.3 Project Statement of Work

The objective of this TO is to remove contaminated soils to meet established remedial action objectives for the CDE site, as defined in the September 30, 2003, Record of Decision (ROD). All TO work will be conducted in accordance with the project statement of work and the proposal clarifications.

For all of the sites associated with this Work Plan, CAPE will perform the following activities:

- ▲ Set up laydown area
- ▲ Mobilize appropriate equipment to laydown area
- ▲ Coordinate and verify utility clearance activities
- ▲ Survey the properties and locate historic boring locations
- ▲ Perform field screening and laboratory conformation sampling
- ▲ Collect and analyze precharacterization samples of soil from the excavation areas and submit profile information to appropriate waste disposal facilities

- ▲ Install erosion-control measures where necessary
- ▲ Perform excavation activities
- ▲ Perform restoration and backfill activities
- ▲ Transport waste soil to appropriate disposal facilities using all required tracking and documentation
- ▲ Obtain final disposition documentation from disposal facility
- ▲ Produce Closeout Reports.

## 2.0 PROJECT ORGANIZATION

This section identifies and defines responsibilities of the principal decision-makers and all persons responsible for implementing the work (see Appendix B, Organizational Chart).

### 2.1 Organization

The following subsections briefly describe the responsibilities of the personnel assigned to this project. All onsite personnel are responsible for complying with the requirements of this Work Plan, SSHP, Quality Control Plan (QCP), and the SAP.

The CAPE Project Manager (PM) and Site Superintendent will be responsible for implementing the plans and ensuring that all work requirements are enforced.

#### 2.1.1 Program Manager

The Program Manager (PGM), Ed King, Professional Engineer (PE), will have the overall responsibility for all technical, contractual, safety, and administrative matters for CAPE under this contract. He will ensure that a high degree of client responsiveness is maintained and will be responsible for:

- ▲ Reviewing and approving plans
- ▲ Overseeing staff selection
- ▲ Monitoring contract and task funds and schedules, and
- ▲ Implementing quality assurance (QA)/QC processes.

Mr. King will delegate day-to-day TO management to the PM, and QC management to the Contractor Quality Control Systems Manager (CQCSM).

### **2.1.2 Project Manager**

The CAPE PM, Michael Lamon, will be responsible for overall direction, implementation, and enforcement of project requirements. His responsibilities include:

- ▲ Ensuring the project is being performed in a manner consistent with the CAPE Corporate Health and Safety Program, the SOW, and the Base Specification Requirements and in accordance with USACE EM 385-1-1.
- ▲ Ensuring that all required plans (SSHHP, CQC Plan, SAP, Environmental Protection Plan [EPP] and Work Plan) are prepared, submitted in a timely manner, and approved by the U.S. Army Corps of Engineers (USACE)
- ▲ Providing project personnel with information related to health and safety matters and other critical issues related to the project
- ▲ Monitoring compliance with the project requirements by CAPE and subcontractor personnel
- ▲ Ensuring adequate resources are provided to the health and safety staff so that they may carry out their duties
- ▲ Maintaining communication with the USACE authorized representative
- ▲ Developing cost control documentation and all notifications to the USACE
- ▲ Performing weekly cost tracking and ensuring that certified payrolls are updated.

The PM will also have the authority to take the following actions:

- ▲ Determine personnel assignments on this project
- ▲ Stop site activities if an imminently dangerous situation exists. The emergency situation will be immediately reviewed with the Site Superintendent, Site Safety and Health Officer (SSHO), Corporate Health and Safety Manager (CHSM), and the USACE authorized representative.

### **2.1.3 Site Superintendent**

The Site Superintendent, Jerry Hackworth, will direct daily implementation and enforcement of the TO requirements during site activities. The Site Superintendent is responsible for oversight and all site activities including the management of field personnel. The Site Superintendent is responsible for implementing actions to ensure compliance with the work plans. Other responsibilities include:

- ▲ Coordinating and providing the necessary labor, equipment, and materials for material handling activities as required by the plan
- ▲ Ensuring site activities are scheduled and executed with adequate personnel and equipment resources to perform the project safely

- ▲ Ensuring adequate communication between field personnel and emergency response personnel is available
- ▲ Ensuring site personnel are trained in accordance with Section 10.0 of the SSHP.

The Site Superintendent will have the authority to stop site activities if an imminently dangerous situation exists. The emergency situation will be immediately reviewed with the PM and the CHSM.

#### **2.1.4 Contractor Quality Control Officer**

The Contractor Quality Control Officer (CQCO) for this contract is Henry Vaca. The CQCO is responsible for the development and interpretation of QC policies and procedures, and carries the requisite authority to oversee and execute QC activities for the projects that will be implemented under this contract. The CQCO is responsible for establishing the definable features of work (DFWs) and the appropriate QC monitoring and testing. He will provide overall direction to the program QC function; perform audits, surveillance, and document reviews; and execute other quality functions as required in the CQC Plan. He will interface with the PM on the quality functions of the program and will coordinate all QC activities. Implementation of the QC duties will be delegated to the QC Officer in the field.

Duties of the CQCO include, but are not limited to, the following:

- ▲ Implementing the project QC requirements
- ▲ Overseeing onsite QC staff
- ▲ Identifying and reporting nonconforming items or activities
- ▲ Initiating or recommending corrective actions
- ▲ Verifying implementation of corrective actions
- ▲ Notifying the QA Director of conditions adverse to quality that cannot be resolved at the project level
- ▲ Overseeing activities to monitor operations for compliance with contract requirements.

#### **2.1.5 Corporate Director of QA/QC**

In accordance with the CAPE QA Program, the Corporate Director of QA/QC, Chris Caviness, PE, *Juris Doctor* (JD), will supervise the QC activities of the CQCSM. In addition, the Corporate Director of QA/QC will serve as a technical resource to the CQCSM. All project QC records and activities are subject to review by the Corporate Director of QA/QC.

### **2.1.6 Contractor Quality Control Systems Manager**

CAPE's Contractor Quality Control Systems Manager (CQCSM), Chuck Reed, will be responsible for overall management of the CQC System and has the authority to act independently in all QC matters. He reports directly to the CAPE QA/QC Director. The CQCSM may have assistance from a Quality Control Technician. The CQCSM's responsibilities are outlined below:

- ▲ Manage the performance of all onsite and offsite inspections and testing
- ▲ Evaluate the results of the inspections and testing
- ▲ Notify the CAPE PM of acceptance or rejection of the work
- ▲ Manage documentation of all inspections and testing and notifications to site project management through Daily Quality Control Reports (DQCRs)
- ▲ Review all required submittals relating to QC, and forward all submittals to the USACE for review and approval.

The CQCSM will have the authority to suspend work for which quality standards are not being met or maintained. Should modifications or revisions to the work relating to quality control be required, the CQCSM will prepare a request for modification or revision, and submit it to the USACE Authorized Representative. The CQCSM will ensure that approval of the modification or revision is received prior to allowing the modifications or revision to occur in the field.

### **2.1.7 Chemistry Quality Control Manager**

CAPE's Corporate Program Chemist, Christelle Newsome, will serve as the technical resource to the QCSM in the area of chemical data QC. All chemistry project records and activities are subject to review by the Chemical Quality Control Manager (ChQCM). The CAPE ChQCM is responsible for ensuring that all chemistry-related project objectives are obtained. These objectives include responsibility for defining all DQOs, sampling and analysis, data documentation and validation, and data QA portions of final project reports. Procedures for corrective actions, deliverables and submittals, deviations and changes, chemical quality documentation, data validation, minimum data reporting requirements, and DQOs for chemical parameter measurement shall be implemented by the ChQCM. The ChQCM shall also review all project chemical data submittals and deliverables developed by the Environmental Sampler. The ChQCM shall be responsible for overseeing the development and submission of the FSP, QAPP and the Chemical Data Final Report (CDFR). Ms. Newsome also functions as the Corporate Program Chemist she is responsible for coordinating communication between the project team, the government laboratory(ies), and the subcontracted laboratories. The Program Chemist shall also be responsible for performing data verification and data review on the analytical data

### **2.1.8 Corporate Health and Safety Manager**

The CHSM, Glen Mayekawa, is a Certified Industrial Hygienist (CIH) with experience in hazardous waste site operations. The CHSM will have the following responsibilities:

- ▲ Interface with the PM about project execution, health and safety-related, and QC issues
- ▲ Approve the SSHP and any amendments
- ▲ Approve revised or new health and safety protocols for site activities
- ▲ Monitor compliance with the SSHP
- ▲ Ensure that all CAPE personnel and subcontractors designated to work on the TO are qualified according to CAPE medical surveillance and training and USACE requirements. Determine and implement personnel disciplinary actions for safety violations
- ▲ Approve the appointment of the SSHO and any replacement SSHOs.

The CHSM will have the authority to take the following actions:

- ▲ Stop site activities if an imminently dangerous situation exists. The emergency situation will be immediately reviewed with the PM, Site Superintendent/SSHO
- ▲ Direct personnel to change a work practice if it is determined to be hazardous to the health and safety of site personnel
- ▲ Remove personnel from the project if their actions endanger their health and safety or the health and safety of co-workers or residents.

### **2.1.9 Site Safety and Health Officer**

The SSHO, Ken Beatty, will serve as an advisor to the PM in matters regarding health and safety. The SSHO for this project will be primarily responsible for the technical and administrative functions relative to health and safety during site activities. The SSHO will have the following responsibilities:

- ▲ Ensure that all site activities are performed in a manner consistent with the SSHP and the CAPE Corporate Health and Safety Program
- ▲ Interface with the CHSM about onsite implementation of the SSHP
- ▲ Direct daily health and safety activities on site
- ▲ Report all incidents, accidents, and near-misses to the CAPE PM, CHSM, and the USACE authorized representative
- ▲ Maintain health and safety equipment on site

- ▲ Inspect ongoing activities and report any health and safety deficiencies to the CHSM
- ▲ Accompany or maintain communication with each work crew
- ▲ Perform site monitoring to assure that site personnel are adequately protected
- ▲ Conduct initial site-specific safety training and regular safety briefing for all site personnel
- ▲ Conduct a safety briefing for all site visitors before entering the site
- ▲ All incidents will be immediately reported verbally to the USACE Onsite Representative with an incident report to be submitted within 24 hours afterwards.

The SSHO will have the authority to take the following actions:

- ▲ Stop site activities if an imminently dangerous situation exists. The emergency situation will be immediately reviewed with the PM, and CHSM
- ▲ Direct personnel to change a work practice if it is determined to be hazardous to the health and safety of site personnel
- ▲ Temporarily suspend an individual from field activities for an infraction of the SSHP, pending discussion with the CHSM
- ▲ The SSHO will report to the CHSM about health and safety-related issues.

#### **2.1.10 Work Crew Personnel**

The work crew will have the following responsibilities:

- ▲ Immediately report any unsafe or potentially hazardous conditions to the SSHO/Site Superintendent
- ▲ Report all incidents, accidents, and near misses, no matter how minor they may seem, immediately to the SSHO/Site Superintendent
- ▲ Maintain knowledge of the information, instructions, and emergency response procedures contained in the SSHP and the work plan
- ▲ Comply with requirements and procedures set forth in the SSHP and other project documents and with any amendments.

#### **2.1.11 Subcontractors**

Subcontractors used to perform this contract SOW will be directed by the PM and on site by the Site Superintendent. All subcontractors are required to follow the guidance found in USACE EM 385-1-1.

### 3.0 GENERAL REQUIREMENTS

#### 3.1 Site Access

Access agreements to each of the four properties including the site staging area along Spicer Avenue will be provided by the U.S. Environmental Protection Agency (EPA) before mobilization. CAPE will maintain copies of the access agreements on site during the construction phase of the project.

The CQCSM will use a site control log that documents the flow of CAPE personnel, project oversight personnel, and visitors in and out of the site.

#### 3.2 Site Control

CAPE will erect temporary construction barriers (i.e., high-visibility fencing) around active work sites to deter entry by unauthorized personnel. Fences will be constructed of orange construction safety fence fabric hung on steel posts set at 10-foot intervals using electrical ties. Fencing will be used in circumstances where heavy or moving equipment is in close proximity to the existing tenants of properties, and to prevent inadvertent entry to sites where equipment is being used. Safety fences will also be erected around any open excavations in areas where there is potential for vehicle or foot traffic.

For the ~~redacted~~ property, orange construction fencing will not be feasible for protection of the property owner's assets. In lieu of construction fencing, temporary chain link-type fence will be installed. This fence will be secured around the excavation area and marked with posted signs deterring public access to the area. The fencing will be linked together and double locked with the property owner to facilitate access for CAPE and the existing property owner.

CAPE will use property provided by the township for an assembly and laydown area. The township property is located on Spicer Avenue across the street from the public works property. Public works personnel have indicated that the laydown area should not be fenced since their personnel use portions of the area for parking. The general location of the assembly and staging area is depicted in Figure 2. Critical equipment and materials will be stored in the laydown area to prevent vandalism and theft.

CAPE will keep at least one person at the job site at all times during work hours for site surveillance. Heavy equipment will be parked in designated areas each night and the keys will be removed. All tools and equipment will be properly stored and work areas will be maintained in an organized manner.

#### 3.3 Protection of Existing Structures and Utility Clearances

CAPE will take necessary measures to protect existing structures, appurtenances, and utilities that may be affected by site activities under this SOW. Before performing any type of ground-intrusive activity (trenching, excavation), the New Jersey One Call system (800-272-1000) will be used for the clearance and location confirmation of all underground utilities. This will include Public Service Electric & Gas (PSE&G), and

other local utility organizations responsible for the mark-out of underground utility locations. Before performing the work, field conditions and utility locations will be verified by all involved CAPE and subcontractor personnel. CAPE may also hire a private utility locator to identify and mark subsurface utilities that may not be identified by New Jersey One Call. The verification process will be documented on the Excavation Safety Checklist (refer to SSHP).

Before intrusive work is initiated at each work area, a site inspection will be performed to identify potential site hazards such as overhead power lines and structures or other features that require special attention. Utility markings will be maintained throughout construction activities. CAPE will avoid all utilities and protect any utilities that may be impacted by the corrective measures.

### **3.4 Safety Requirements**

CAPE's Emergency Response Plan is contained in the SSHP, which is provided under separate cover. The SSHP explains the operations necessary to ensure compliance with federal Occupational Safety and Health Administration (OSHA), American National Standards Institute (ANSI), and USACE safety regulations. CAPE will implement necessary preventive measures for the safe handling of contaminated soil and other wastes generated as a result of this project.

### **3.5 Decontamination Procedures**

Decontamination procedures will meet the requirements set forth in the PCB Mega Rule. Heavy equipment will be decontaminated by dry means (e.g., brushes, shovels) and/or with a power washer and water-soap solution. Solids will be collected and disposed with the waste soil, and liquids will be containerized, characterized, and disposed appropriately. Decontamination equipment and solutions will be treated and/or disposed in accordance with the SAP (Appendix C).

#### **3.5.1 Dry Decontamination**

- ▲ Using shovels and brooms, remove large dirt clods and debris. If possible, lift and spin tracks to loosen material
- ▲ Collect solids and combine with waste soil.

#### **3.5.2 Wet Pressure-Washing Decontamination**

- ▲ Wet decontamination will be performed in an area that is covered with plastic sheeting and is bermed to contain all fluids
- ▲ Using a pressure washer, direct-spray all areas that have been exposed to contaminated soils including tires, tracks, and buckets. Make sure all visible dirt is removed

- ▲ Collect and containerize waste solids and liquids. Solids will be combined with waste soil, and liquids will be containerized in 55-gallon drums and staged as described in the SAP (Appendix C).

For hand-auger sampling, it is not possible to exclusively use disposable sampling equipment. Rods, flights, and spoons will require field decontamination between sampling locations and between actual samples when more than one sample is to be collected at a given location. Decontamination of nondisposable sampling equipment that comes in contact with samples will be performed to prevent the introduction of extraneous material into samples, and to prevent cross-contamination between samples.

The following procedures will be used for field decontamination of nondisposable sampling equipment and personal protective equipment (PPE):

1. Rinse with potable water. This step will decrease the gross contamination and reduce the frequency at which the nonphosphate detergent and water solution need to be changed. Change the water frequently.
2. Wash with the nonphosphate detergent and water solution. This step will remove remaining contamination from the equipment. Dilute the nonphosphate detergent as directed by the manufacturer.
3. Rinse with potable water. This step will rinse the detergent solution away from the equipment. Change the water frequently.
4. Triple-rinse with deionized water. This step will rinse any detergent solution and potable water residues. Rinsing will be done by applying the deionized water from a stainless steel Hudson-type sprayer or squeeze bottle made of Nalgene™ or Teflon™ (or equivalent) while holding equipment over a 5-gallon bucket.
5. Allow equipment to air dry. Rinsate will be placed in drums or tanks and staged for disposal.

## **4.0 PROJECT ACTIVITIES**

The following subsections provide details of the Remediation Actions associated with the four properties:

### **4.1 Premobilization Activities**

CAPE will mobilize a Site Superintendent/QC Officer/SSHO before beginning site work. Heavy equipment will be mobilized from local suppliers throughout the duration of fieldwork to address the ongoing needs at the site. Site preparation will include verifying utility locations, installing erosion controls that comply with local regulations, clearing and grubbing (where required), constructing laydown and staging areas, establishing access routes for equipment and transport vehicles, obtaining soil and sediment control permitting or equivalency, and delineating work areas.

CAPE will also prepare an informative one- to two-page newsletter that will be circulated to the property owners in the surrounding neighborhood. The newsletter will identify the scope of services provided by CAPE, the relevant points of contact for questions regarding CAPE's work, and the anticipated hours of operation.

#### **4.1.1 Procurement Activities**

CAPE staff will initiate project control documentation with vendors to establish clear and compliant lines for procurement. The following activities will be performed:

- ▲ The PM and Project Coordinator will identify disposal facilities that can accept the materials generated by this project. The Project Coordinator will evaluate and document costs and locations and communicate pertinent information to the PM. The Project Coordinator will also initiate subcontract agreements and/or purchase orders for waste hauling and disposal of hazardous and nonhazardous materials
- ▲ The Project Coordinator will also work with local vendors to arrange delivery of site trailers, sanitary facilities, backfill and topsoil borrow sources, and materials.

#### **4.2 Standard Operating Procedures**

The following section pertains to ongoing operations that are key elements involved during each DFW. A list of proposed equipment to be used on site, emissions and dust control procedures to be used on site, noise control/reduction techniques to be used, and a dewatering plan are presented below:

##### **4.2.1 Equipment**

The equipment used on site will vary depending upon the scheduled work task. An initial list of equipment to be used on site, including quantities and anticipated work tasks, is as follows:

- ▲ Excavator (1)–Site preparation, excavation and backfilling
- ▲ Front-End Loader or Skid-Steer Loader (1)–Hauling debris, loading waste containers and trucks, transport bedding and backfill material
- ▲ Compactor (1)–Compacting fill
- ▲ Dozer (1)–Backfilling and site restoration.

##### **4.2.2 Emissions and Dust Control**

Emission and dust control procedures will be ongoing throughout the duration of the project. They will consist of a water misting apparatus that will be moved around the sites. All equipment routes within the work areas and haul routes on the site will be subject to emissions and dust control procedures.

Watering of the roadways and vehicle/equipment routes will be performed on an as needed basis to ensure zero/low emissions and will be contingent upon weather conditions. At the first notice of visible dust emissions from the road surface, watering will be conducted to saturate the ground surface. During periods of dry weather and heat, the operation may have to be conducted on a more regular basis due to the evaporation of water from the material.

Refer to the SSHP for information regarding exposure monitoring and action levels for the site perimeter and personnel dust monitoring. Refer to the EPP (Section 7.0) for more specifics regarding emissions and dust control.

#### **4.2.3 Noise Control**

Noise will be kept to a minimum by allowing work to proceed during daylight operating hours only. The anticipated work hours for the site are from 07:00 hours to 17:30 hours local time. Work will not be allowed to start before or continue past the above-stated times without prior approval from the Contracting Officer's Representative (COR).

Noise exposures in excess of 85 decibels on A-weighted scale (dBA) are assumed to be present whenever voices must be raised to be heard in normal conversation at 3 feet apart and also whenever working in the immediate areas of operating generators, compressors, and similar equipment. Site personnel working in the immediate area of operating equipment are required to use hearing protection (e.g., foam ear plugs) whenever noise exposures exceed 85 dBA. Noise levels decrease dramatically over distance and are not anticipated to pose a risk to bystanders located outside of the limits of disturbance. If excessive noise is deemed to be a concern on the site, a decimeter will be used to monitor sound levels. Refer to the SSHP for information regarding noise monitoring and hearing protection requirements.

### **4.3 Mobilization and Site Preparation**

CAPE will mobilize all resources including personnel, equipment, materials, and supplies required to execute the contract SOW. Specific mobilization activities include:

- ▲ Establishing CAPE site presence
- ▲ Constructing the CAPE laydown areas
- ▲ Setting up USACE and CAPE construction trailers and utilities
- ▲ Installing secure fencing and temporary fencing throughout the excavation sites
- ▲ Installing sediment and erosion control devices
- ▲ Delineating the Exclusion Zones
- ▲ Posting signage
- ▲ Installing barricade fencing.
- ▲ Conducting site-specific training in accordance with the SSHP
- ▲ Conducting site-specific training in accordance with this Work Plan
- ▲ Acquiring and delivering equipment, materials, and supplies to the site
- ▲ Establishing administrative procedures
- ▲ Posting labor notifications in site trailer.

The location of the laydown area is depicted in Figure 2.

CAPE personnel and subcontractors will receive initial site orientation and training before starting field activities. Initial orientation and training will cover the requirements of the Work Plan and SSHP, including personnel responsibilities, potential hazards, hazard recognition, and site-specific procedures. Additional information regarding the above tasks is presented in the EPP and the SSHP.

An Exclusion Zone will be established around the areas where contaminated soils may be encountered using orange construction fence. Staging areas will be established for contaminated and noncontaminated materials. Refer to the Waste Management Plan (Section 5.0) portion of the EPP for specifics regarding the staging and disposal of contaminated soils and groundwater.

#### **4.3.1 Surveying**

CAPE will use a professional land surveyor to locate historic sampling locations, demark the property boundaries and document the remedial actions performed at each property. Survey data collected by CAPE will be collected in accordance with New Jersey state plane coordinate system.

#### **4.4 Utility Clearance**

Before intrusive work is initiated at each work area, a site inspection will be performed to identify potential site hazards, such as overhead power lines and structures or other features that require special attention. Before conducting any subsurface work, CAPE will request utility location from New Jersey One Call and also procure a private utility location service to mark utilities on site. If unidentified or incorrectly marked utilities are encountered, the Contracting Officer or their designated representative shall be notified immediately. Utility markings will be maintained throughout construction activities.

#### **4.5 Property Remediation**

Each of the four properties undergoing remedial actions will be subject to a systematic approach to complete the desired remedial objective of 1 mg/kg of PCBs as finalized in the ROD for Operable Unit (OU) 1.

##### **4.5.1 Initial Survey**

Each property will be surveyed before any intrusive work to locate historic borings and demarcate the property boundaries. The initial survey includes photographic documentation of all property features. Photo documentation will continue throughout the project.

##### **4.5.2 Field Screening and Laboratory Confirmation Testing**

Once the survey has located the historic boring location, CAPE will perform field screening using an SDI PCB Immunoassay Sampling Kit. CAPE will follow New Jersey

Administrative Code (NJAC) 7:26E 3.6(a)5. The field screening will be conducted in a stepwise fashion as indicated below:

- ▲ Enclose the historic boring locations with a 5- by 5-foot grid painted on the ground surface. Each side of the grid will be oriented in a north-south, east-west orientation
- ▲ Field screening samples will be collected from each side of the grid and from the center (location of the historic boring). The four samples collected from each of the sides will be considered sidewall samples, while the center one will be considered the excavation bottom sample. The depths of these samples vary depending on the depth of the historic sample
- ▲ If the results of the field screening test indicate a nondetectable level (0.5 parts per million [ppm] or less), soil from that location will be sent to an analytical laboratory for definitive data confirmation
- ▲ If the results of the field screening test indicate a concentration greater than 1 ppm the 5- by 5-foot grid will expand following the further field screening at the detect location to determine the vertical extent of excavation. Nondetectable field screening results will be confirmed by fixed laboratory data and used as confirmation that the impacted soils have been remediated
- ▲ Following the determination of vertical extent at detect locations, the grid will expand at 5-foot intervals until a nondetectable level (0.5 ppm or less) is achieved. In general, excavation bottom samples will be biased toward the locations exhibiting the highest field screening concentration. This process will continue until all the concentrations are less than 1 ppm and they are confirmed by the analytical laboratory
- ▲ If field screening results indicate that concentrations exceed 1 ppm for PCBs at the property boundary, CAPE will notify the COR that further sampling beyond the property boundary may be required. CAPE will not extend the sampling beyond the property boundary until an access agreement has been established by U.S. EPA and directed by the COR to sample
- ▲ If PCB contamination extends past the property boundary, per the direction of U.S. EPA and USACE COR, polyethylene sheeting will be placed at the boundary and the area will be surveyed and subsequently backfilled for excavation at a later date.

#### **4.5.3 Excavation**

Once the area(s) are delineated, CAPE will excavate to the depth specified by the field screening and confirmation sampling. Excavation will be performed using small track-mounted excavators with a combination of live-loaded trucks and rolloff containers. Due to the small size of the excavation areas, rolloff containers will likely be used at three of the four locations with the exception of the 321 Spicer Avenue property.

Due to the type of business at 507 Hamilton (i.e., daycare center), CAPE will excavate and backfill the area over a weekend in lieu of a standard workweek. The other properties will be excavated during a standard workweek, Monday through Friday, using the hours indicated in previous sections.

#### **4.5.4 Backfill and Compaction**

CAPE will make every effort to ensure that no excavation is left open for an extended period of time (over night). Once the contaminated material is removed to the depth required to achieve the remedial goals, the area will be backfilled and restored to preconstruction conditions.

The topsoil brought in from offsite borrow sources will meet the requirements of New Jersey Department of Transportation (NJ DOT) 909.10 and American Society for Testing and Materials (ASTM) D 5268 and be tested in accordance with ASTM D 5268 and 4972 for determining particle size, pH, organic matter content, textural class, chemical analysis, soluble salts analysis, and mechanical analysis. Backfill will be free of organic material, recycled material, broken concrete, masonry, rubble, asphalt pavement, frozen materials, rubbish, contaminated materials, stones larger than 2 inches, or other unsuitable materials. In addition, all material used to backfill the excavation will be certified pursuant to NJAC 7:26E 6.4(b)2 and 3. Refer to the NJDEP Technical Rules for site remediation at <http://www.nj.gov/dep/srp/regs/techrule/techrl06.pdf>. Certificates of compliance with the above parameters will be submitted to the COR for approval.

Each property will be evaluated to see if a more structurally competent material is required, considering that excavation of existing soil may extend beyond the top 6 inches of soil. Backfill material will be uniformly spread, graded, and compacted with a minimum thickness of 6 inches and left free of surface irregularities. The backfill material will not be placed when the sub-grade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to seeding, planting, or proper grading. The topsoil will be compacted if necessary to facilitate vegetative growth.

Sod will be placed and trees/shrubs will be replaced to ensure site conditions are returned to the preexisting conditions to the extent possible. CAPE will provide information to the property owners regarding care and maintenance of sodded areas including appropriate water methods and durations as well as staying off of the repaired area for at least 2 weeks to ensure the placed sod is not damaged.

#### **4.6 Demobilization**

Upon the conclusion of construction activities at the site, all storage facilities, containment structures, office trailers, port-a-johns, waste materials, stored materials, utilities, barricades, and signs will be dismantled and removed from the project site. Staging areas will be properly cleaned up and graded to conform to adjacent areas. The condition of these areas shall be left so not to detract from the appearance of the surrounding areas. If necessary, a street sweeper will be used to remove any areas where fill materials have been stockpiled or tracked.

A timely disconnect of utilities to the temporary office facilities will be performed upon completion of field activities to reduce the unnecessary consumption of energy. Provided permanent vegetative sediment and erosion control applications (seeding) have reached acceptable maturity and functionality, temporary sediment and erosion control devices such as silt fence, hay bales, outlet protections, etc., will be removed from the site.

## **5.0 WASTE MANAGEMENT PLAN**

CAPE, as the prime contractor, is responsible for ensuring adherence to this Waste Management Plan.

### **5.1 Contaminated Soil Loadout, Transportation, and Disposal**

CAPE will supervise the transportation and disposal by a subcontractor of all waste streams associated with the project work. Waste profiles and shipping manifests will be signed by a government authorized representative.

Results from PCB field-screening measurements and laboratory analyses will be used to delineate excavation boundaries based on the horizontal and vertical extents of contamination. The decision rules relate to whether or not the concentrations of contaminants (PCBs) meet the requirements outlined below:

The initial decision for the excavation soil samples (i.e., PCB field test kit soil samples, split samples, and confirmation soil samples) will be based on a comparison of analytical results to the *EPA Guidance for Data Quality Objectives Process, EPA QA/G-4, EPA 600/R 96-055* (EPA, 2000). The decision statements are described below:

- ▲ If excavation soil samples meet the 1 ppm EPA cleanup objective for PCBs, the soil underneath the excavated soils may be considered uncontaminated and no further excavation in this area is required
- ▲ If excavation soil samples exceed the 1 ppm EPA cleanup objective for PCBs, the soil below the excavated soils may be considered contaminated and further excavation and sampling will be required.

The initial decision for the waste profile samples will be based on a comparison of analytical results to the TCLP regulatory criteria, 40 CFR Part 261, (and disposal facility requirements). The decision statements are described below:

- ▲ If waste passes the TCLP criteria, and has PCB concentrations less than 50ppm, then the materials will need to be disposed of off site at an approved landfill
- ▲ If waste fails the TCLP criteria but passes the Toxic Substances Control Act (TSCA) (PCB) requirements, then the materials will need to be disposed off site at an approved Resource Conservation and Recovery Act (RCRA) Subtitle C or D landfill facility (and wastewater must be disposed at an approved RCRA treatment and disposal facility)

- ▲ If waste contains PCB concentrations greater than 50 ppm, then the materials will need to be disposed off site at an approved TSCA facility.

## **5.2 Waste Storage Areas**

Rolloff boxes, containers, and tanks of remediation wastes will be stored in a temporary accumulation area designated by the USACE. If the USACE has not designated an accumulation area, CAPE will temporarily store wastes in a secure area. Waste storage areas will contain emergency equipment including fire extinguishers, decontamination equipment, and an alarm system (if radio equipment is not available to all staff working in storage area).

CDE wastes will be stored in one of the following settings and according to the following requirements.

### **5.2.1 Drums/Small Containers**

- ▲ Drums and small containers of waste will be transported to the temporary accumulation areas on wood pallets and will be secured together with nonmetallic bonding
- ▲ Drums will be inspected and inventoried upon arrival on site for signs of contamination and/or deterioration
- ▲ Adequate aisle space (e.g., 30 inches) will be provided for containers such as 55-gallon drums to allow the unobstructed movement of personnel and equipment. A row of drums should be no more than two drums wide
- ▲ Drums may not be stacked more than two high
- ▲ Each drum will be provided with its own label
- ▲ Drums will remain covered except when removing or adding waste to the drum. Covers will be properly secured at the end of each workday
- ▲ Drums will be disposed of with the contents. If the contents are removed from the drums for offsite transportation and treatment or disposal, the drums will be decontaminated before reuse or before leaving the site
- ▲ Secondary containment will be provided for drums of liquid waste or wastes that are incompatible with other wastes or materials stored nearby.

### **5.2.2 Portable Tanks**

Only nonstationary tanks (such as cargo tank or other wheeled tank) will be used to accumulate waste.

- ▲ Tanks will be provided with secondary containment
- ▲ Tanks will be inspected upon arrival on site for signs of deterioration and contamination. Any tank arriving on site with contents will be rejected

- ▲ Tanks will be provided with covers
- ▲ Each tank will be labeled.

### **5.2.3 Stockpiles**

The following procedures will be followed when stockpiling soils:

- ▲ Stockpiles will be located near the excavation areas and within an area of existing contamination
- ▲ Stockpiles will be provided with a liner, cover, and perimeter berm to prevent release or infiltration of liquids
- ▲ The perimeter berm, typically hay bales placed beneath the liner, will be constructed to allow for collection of any free liquids draining from the stockpile
- ▲ Accumulated free liquids will be pumped (or otherwise removed) to a container
- ▲ Covers will be provided as necessary to prevent wind dispersion or run-on/runoff from precipitation events
- ▲ Minimum 6-mil polyethylene sheeting will be used for liners and covers
- ▲ The liner must be placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure
- ▲ Covers and perimeter berms will be secured in-place when not in use and at the end of each workday
- ▲ Construction materials for the stockpiles that contact waste will be disposed of as contaminated debris
- ▲ PCB remediation waste will have a run-on control system designed, constructed, operated, and maintained such that it prevents flow onto the stored waste during storms, and collects and controls the water volume resulting from a 24-hour, 25-year storm
- ▲ A log documenting accumulation dates will be maintained for soils and other waste stored on site in stockpiles.

### **5.2.4 Rolloff Boxes**

- ▲ Rolloff boxes will be inspected upon arrival on site. Any rolloff containers arriving with contents will be rejected
- ▲ Rolloff boxes for hazardous or PCB-contaminated soils will be provided with covers and disposable liners. Liners will be disposed of as contaminated debris

- ▲ When not in use, securely fastened covers will be installed on all rolloff boxes
- ▲ Old labels will be removed
- ▲ Rolloff containers will be inspected by the transporter after removal of the liner and decontaminated in the event of evidence of liner failure.

## 6.0 ENVIRONMENTAL PROTECTION PLAN

CAPE, as the prime contractor, is responsible for ensuring adherence to this EPP.

### 6.1 Protection of Features

CAPE will confine construction activities to areas defined in the plans or to areas specifically assigned for CAPE's use. Storage and related areas and access routes required temporarily by CAPE will be determined at the time of construction.

### 6.2 Spill Control Plan

CAPE will be responsible for any spills or leaks caused by its operations during the performance of this contract. CAPE will provide contingency measures for potential onsite spills of any potentially hazardous or other regulated materials. CAPE will provide the following:

- ▲ Identification of potential spill pathways and receptors
- ▲ Methods, means, and facilities to prevent contamination of soil, water, air, structures, equipment, or material from a release due to CAPE's operations
- ▲ Equipment and personnel to perform emergency measures to mitigate spills and control their migration
- ▲ A decontamination program to minimize potential for contamination of adjacent areas.

### 6.3 Spill Response

The methods employed on this project to prevent and control spills will include lining soil stockpile areas with polyethylene sheeting; installing liners inside rolloff boxes; carefully loading soil into trucks to avoid spillage; and always using good work practices to avoid unnecessary spillage.

The following requirements will be met for a spill of a hazardous material:

- ▲ Take immediate measures to control and contain the spill to prevent release into sewers or surface waters
- ▲ Notify the USACE Representative immediately

- ▲ Notify the fire department immediately at 9-1-1
- ▲ If the amount is above a reportable quantity or if any amount enters a waterway or storm sewer, CAPE will notify both The National Response Center Spill Reporting Hotline at 1-800-424-8802 and the New Jersey Department of Environmental Protection at 877.927.6337 within 30 minutes of the spill
- ▲ Isolate and contain hazardous spill areas with absorbent pads, booms, and pillows
- ▲ Use spill kits to absorb liquids
- ▲ For larger spills, dispatch vacuum tanker and/or emergency response team
- ▲ Deny entry to unauthorized personnel
- ▲ Do not allow anyone to touch the spilled material
- ▲ Stay upwind and keep out of low areas
- ▲ Keep combustibles away from the spilled material
- ▲ Collect samples for analysis to determine that cleanup is adequate
- ▲ Take other appropriate actions, as needed.

#### **6.4 Dust Control**

Dust may be generated by construction activities during dry weather. If visible dust appears to be generated within the breathing zone of workers or capable of migrating beyond the construction limits at any of the sites, dust control measures will be implemented. The measures may include covering stockpiled soils or spraying water on the soils and worksite. If dust is still not adequately controlled, workers exposed to the dust may be required to upgrade their PPE from Level D to Level C (full-face respirator with the appropriate cartridge) in accordance with the SSHP. The particulate (dust) concentration and action levels will be determined and documented as described in the SSHP, and PPE upgrade will be performed if the particulate action level is exceeded. If particulate (dust) levels along the perimeter of the work areas exceed the levels indicated in the SSHP, work will stop and additional engineering controls will be implemented.

Additionally, air samples will be collected and analyzed for PCBs to verify that PCBs are not being emitted from the excavation activities performed by CAPE.

#### **6.5 Contamination Prevention Plan**

All activities will be performed in a manner to minimize risk for accidental release to the environment, minimize unsafe worker conditions, and minimize complications and delays to project completion. CAPE will minimize the number of times contaminated sediments and soils are handled. Onsite handling of soils will occur during excavation, loading, and sampling activities. Soils that are stockpiled on site will be stored on top of a bermed polyethylene liner and covered with polyethylene to prevent contaminants from

migrating off site or into clean soil below the pile. All polyethylene covers will be secured via sandbags.

Exclusion zones and will be established within the work areas by the SSHO. All heavy equipment, machinery, vehicles, instrumentation, and personnel will be decontaminated before exiting these zones in an effort to minimize migration of contaminants.

## **7.0 CONTRACTOR QUALITY CONTROL PLAN**

The following section outlines the use of operational procedures to ensure CQC from the preparatory stages of vendor material inspections and project plan reviews to delivery of a final product to the USACE Kansas City and New York districts for the remedial actions to be performed at the CDE Superfund site. This section also covers actual procedure selection, control, monitoring, change, and application to remedial measures and construction activities outlined in the project SOW.

### **7.1 QC Coordination**

The PM will effectively communicate the content and intentions of the contract documents to all members of the project team to ensure consistency of project understanding and planned implementation. Coordination will be based upon the concept of the three-phase QC inspection process (preparatory, initial, and follow-up). Scheduled coordination activities will be detailed on the project's field schedule to integrate the QC process into all aspects of the project. CAPE will provide notification to the USACE Representative for coordination of meetings, inspections, testing, and start-up activities at the job site. CAPE will provide required engineering and other support services throughout the construction process, accurate test results, and field reports.

### **7.2 Meetings**

#### **7.2.1 Preconstruction Safety and Quality Management Coordination Meeting**

Before the start of construction, a preconstruction quality management coordination meeting will be held. During this meeting between CAPE's staff and the appropriate USACE personnel, a mutual understanding of the QC System details (on site and off site) will be established, including procedures and documentation for CQC operations, control activities, and testing. A mutual understanding of all health and safety requirements and policies will be achieved and attendees will be required to sign a mutual understanding statement.

Relevant QC topics discussed in this meeting will include, but are not limited to, the following:

- ▲ QC documentation and each organization's role relative to design criteria, plans, and specifications and the QC process
- ▲ QC staff, responsibilities, authorities, and communication procedures
- ▲ Methods for modifying the CQC Plan

- ▲ DFWs
- ▲ Three-phase control system
- ▲ Procedures for observation, testing, and sampling
- ▲ Procedures for nonconformance identification, documentation, and resolution
- ▲ DQCRs
- ▲ Document control
- ▲ Construction schedule.

This meeting will be conducted by the onsite USACE representative and attended by the PM and QC staff and other team members including, but not limited to, the Site Superintendent, the CQCSM (or designated representative), and the SSHO, as required. Minutes of this meeting will be recorded by a USACE representative and distributed to all participants. From that point on, the CQC Plan will be used to inspect and document the delivery of a quality product and service. Ongoing QC meetings, coordination of construction activities, and maintaining accurate field records will be the means used to maintain effective follow-up QC. All appropriate members of the project team, including subcontractors, will be required to participate

### 7.3 **Progress Meetings**

During fieldwork, progress meetings will be scheduled weekly or as established by the onsite USACE representative to address significant questions, establish new guidelines, introduce a new aspect to the project, or to address issues that affect the progress of the work. The PM, CQCSM, and other appropriate CAPE personnel will attend these meetings and record and distribute the meeting minutes.

Topics that typically will be addressed at the progress meetings include:

- ▲ Review and approval of minutes of previous meeting
- ▲ Review of safety and health requirements and procedures
- ▲ Review of QC requirements and procedures
- ▲ Review of cost reports
- ▲ Review of work progress
- ▲ Field observations, problems, and conflicts
- ▲ Revisions to project schedule, percent of work completed, coordination of scheduled activities, and review of submittal schedules
- ▲ Pending changes and substitutions

- ▲ Review proposed changes for effect on construction and on completion date, and effect on other contracts of the project.

#### **7.4 Daily Safety Meetings**

The Site Superintendent and the SSHO will assess each work area for potential hazards before beginning work in that area and will hold daily safety meetings with all site personnel at the beginning of every work shift. These daily safety meetings will be brief and meaningful. A daily tailgate safety meeting record will be used to document the meeting. A serious discussion will occur on the following issues as they pertain to each day's work:

- ▲ Review of the activity hazard analyses (AHAs) for specific tasks to be conducted on that day
- ▲ Work planned for the current day and any coordination required to maintain a no-delay schedule
- ▲ Safety hazards associated with specific DFW
- ▲ Tools and equipment to be used, and special safety and maintenance procedures/requirements to be used with the equipment
- ▲ Prework inspections to be performed
- ▲ Emergency plan including brief review of emergency hospital route
- ▲ End-of-day work area condition including cleanup, placement of equipment and materials, and preparation for next day
- ▲ Compliance with USACE EM 385-1-1.

#### **7.5 Selection, Approval, and Monitoring**

The USACE representative, PM, Site Superintendent, and CQCSM will approve all detailed QC procedures incorporated into the CQC Plan using the QCS portion of the Resident Management System (RMS). The same parties will approve subsequent changes following initiation of work. QC monitoring, observation, and surveillance systems will be coordinated with key construction steps under each DFW, testing, and three-phase QC inspection point.

The CQCSM will keep a daily logbook to document observations of construction activities and will report on the status of ongoing testing and analytical results and any other data relevant to the QC effort. The daily logbook will be used to support the DCQR and will be archived as part of project records. The CQCSM will closely monitor the actual field testing, verifying proper procedure technique, sample handling, and chain of custody, if required. The CQCSM will report the results of testing to provide timely authorization to proceed with work sequence or initiate nonconformance action.

## **7.6 Change and Control Procedures**

CAPE will identify, document, and track the status of changes in project activities via the RMS. The RMS will document changes in procedures or conditions that are inconsistent with the stated SOW and could have a cost impact on the project. Proposed changes that have not physically occurred will also be documented in the RMS.

The CQCSM will be required to input contractor data into the RMS. The PM will discuss potential changes with the appropriate USACE representative and CAPE's technical staff. The CQCSM will monitor the documentation and provide support. The PM will review any change request.

CAPE's PM will use the Work Variation Notification (WVN) process to document variances to the project SOW and contract requirements. The WVN will include a description of the original requirement versus the proposed change, the technical justification for the proposed change, and the cost and schedule impacts. The government will review the WVN and will issue direction to move forward with the deviation or to stop work.

## **7.7 Definable Features of Work**

This section identifies the construction activities as DFWs that will require QC monitoring, testing, and observation. A DFW is an activity that is separate and distinct from other activities and that requires separate QC activities. In general, each discipline or work item is considered a DFW. Subactivities within a discipline or work item can be considered a DFW if separate and distinct control requirements exist. QC is accomplished for each of these DFWs using the USACE three-phase process.

Surveillance during the execution of these activities will be noted on the appropriate forms. For each task assignment, specific charts, checklists, etc., will be prepared to assist the CQCSM in ensuring that the work elements are properly performed. QC observations and testing by DFW is presented in subsequent subsections.

For the purposes of this plan, CAPE has organized the project SOW into the following DFW activities:

- ▲ Project planning
- ▲ Mobilizing personnel, equipment, and materials to the site
- ▲ Setting up project trailer
- ▲ Establishing site control work zones
- ▲ Field screening and laboratory confirmation sampling
- ▲ Erosion and sediment control
- ▲ Excavating and removing soil
- ▲ Restoring the site
- ▲ Photo documentation
- ▲ Transporting and disposing of wastes
- ▲ Demobilizing.

## 7.8 Inspections

To ensure that all construction activities comply with the requirements of the contract, CAPE's QC Officer or another designated member of the QC Team will perform QC inspections. The types of QC inspections will include preparatory, initial, follow-up, and completion inspections for all DFWs. For each preparatory and initial inspection, the QC Officer will develop a narrative description that presents the detailed QC procedures to be used. This documentation will be finalized and approved at the QC meeting held for each distinct inspection and will become part of the minutes to the meeting that are attached to the DQCR. The QC inspection will be scheduled and conducted by the QC Officer or another designated member of the QC Team. The QC Officer or another designated member of the QC Team will document all QC meetings with meeting minutes. The forms for documenting preparatory and initial inspections are included in Appendix D. Compliance with all QC requirements is accomplished by using this three-phase process for all DFWs.

### 7.8.1 Preparatory Phase

The QC Officer or another designated member of the QC Team will review construction drawings, submittal status, material requirements and onsite availability, worker qualifications, and equipment requirements before beginning work on each DFW. This review will be performed with all subcontractors involved in the DFW. During this phase, qualified staff will be assigned, testing controls prepared, and safety concerns addressed. This phase will include:

- ▲ Review of the particular activity in the Work Plan
- ▲ Verification that all required submittals have been completed and approved
- ▲ Review to ensure that all materials and equipment have been delivered, tested, and approved
- ▲ Review of provisions to provide required control inspection and testing
- ▲ Examination of the work area to ensure that all required preliminary work has been completed and is in compliance with the contract
- ▲ Physical examination of required materials and equipment to ensure that they are on hand; conform to approved plans, drawings, or other submitted data; and are properly stored
- ▲ Review of the appropriate AHA to ensure safety requirements are met
- ▲ Discussion of procedures for controlling quality of the work including repetitive deficiencies
- ▲ A check to ensure that the plan for the work to be performed has been accepted by the USACE Representative

- ▲ Discussion of the initial control phase
- ▲ Documentation of the QC process including narrative description of detailed QC inspection procedures, meeting minutes, inspection results, corrective measures, etc., using forms presented in Appendix D.

CAPE will notify the USACE Representative at least 48 hours in advance of beginning the preparatory phase. This phase will also include a meeting conducted by the QC Officer or another designated member of the QC Team and attended by the Site Superintendent and other appropriate staff responsible for the DFW. The results of the preparatory phase actions will be documented by separate minutes prepared by the QC Officer or another designated member of the QC Team and attached to the DQCR. The QC Officer or another designated member of the QC Team will also instruct applicable subcontractor staff as to the acceptable level of workmanship required to meet contract specifications and familiarize all workers with the safety precautions developed in the AHA.

### **7.8.2 Initial Phase**

This phase of inspection must be accomplished at the beginning of physical work on a DFW. The initial phase will verify that control for the work developed in the preparatory meeting is implemented and work is performed to the level of workmanship mutually agreed upon. CAPE will ensure that subcontractor and CAPE workers understand, through immediate inspection, the contract standards, and the standards of workmanship desired. If there is a difference of opinion in the interpretation of contract requirements, the issue will be settled at this time. The initial inspection phase is a practical method of performing preventive inspection and resolving conflicts. The following will be accomplished during this phase:

- ▲ A check of work to ensure that it is in full compliance with the contract requirements. Minutes of the preparatory meeting will be reviewed
- ▲ Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing
- ▲ Establish level of workmanship and verify that it meets the desired acceptable workmanship standards
- ▲ Resolve all differences
- ▲ Check safety to include compliance with and upgrading (if necessary) of the safety plan and AHA. Review the AHA with each worker
- ▲ Documentation of QC process, including narrative description of detailed QC inspection procedures, minutes of meetings, inspection results, corrective measures, etc., using forms presented in Appendix D.

CAPE's QC Officer or another designated member of the QC Team will notify the USACE Representative at least 48 hours in advance of beginning the initial phase. Separate minutes of this phase will be prepared by the QC Officer or another designated member of the QC Team and attached to the DQCR. Exact location of the initial phase will be indicated for future reference and comparison with the follow-up phase.

The initial phase will be repeated for each new crew working on site any time after an extended work stoppage (greater than a week) or any time acceptable specified quality standards are not being met.

### **7.8.3 Follow-Up Phase**

Follow-up inspection and testing will be geared to a level of effort sufficient to verify the continuation of contract compliance and standards of workmanship established during the previous two phases. Daily checks will be made a matter of record in the CQC documentation for each DFW. Final follow-up checks will be conducted, and all deficiencies will be corrected before the start of additional DFWs that may be affected by any deficient work.

### **7.8.4 Additional Preparatory and Initial Phases**

Additional preparatory and initial phase inspections will be conducted of the same DFWs if the quality of ongoing work is unacceptable, if there are changes in the CQC staff or work crew, if work on a DFW is resumed after a substantial period of inactivity, or if other problems develop.

### **7.8.5 Completion Phase**

At the completion of the DFW, the QC Officer or another designated member of the QC Team will conduct a completion inspection to verify that all work items are complete and in conformance with the project plans and specifications.

Prefinal Inspection. Upon completion of all work, the QC Officer will conduct an inspection of the work and develop a punch list of items that do not conform to the approved drawings and Work Plan. Such a list of deficiencies will be included in the CQC documentation and will include the estimated date by which the deficiencies will be corrected. These inspections and any deficiency corrections required following prefinal and final inspections will be accomplished within the time slated for completion of the project.

Final Acceptance Inspection. CAPE's CQCSM or other designated member of the QC Team, representatives from applicable subcontractors, and the USACE Representative will be in attendance at this inspection. The USACE Representative will formally schedule the final acceptance inspection. Notice will be given to the USACE Representative at least 14 days before the planned final acceptance inspection date.

## **7.9 Nonconformance and Corrective Action**

All identified nonconforming construction methods, procedures, and materials will be corrected through systematic actions. Any time a condition exists that does not comply with the project plans, applicable codes, workmanship standards, or Navy requirements, the nonconformity will be resolved. The QC Officer will take the following actions:

- ▲ If at any time materials or workmanship are observed that do not comply with project plans, codes, or acceptable construction practices, the QC Officer will notify the CAPE Site Superintendent and subcontractor (if appropriate) to initiate prompt corrective action
- ▲ The discrepancies, if they cannot be verbally communicated and corrected immediately, will be documented on a Nonconformance Report (NCR) form (see Appendix D). A detailed description will be given of the item or condition that has failed to meet the project plan or other requirements with an explanation of conditions at the time of failure and its probable cause
- ▲ The QC Officer, subcontractor, and Site Superintendent will evaluate discrepancies, coordinate the problem resolution, and determine methods of correction that will prevent recurrence of the problem
- ▲ When corrective action is complete, the item will again undergo a final inspection
- ▲ The QC Officer will note on the Final Acceptance Report any retest required and performed, nondestructive examination (NDE) required and performed, or changes in identification of any replacement parts used in correcting the problem.

A distribution list for discrepancy reports will be determined at the initial project-planning meeting. At a minimum, distribution will include the USACE Representative, PM, Site Superintendent, CQCSM, and CAPE's QA Director.

## **7.10 Documentation**

QC records are the primary means of documenting and reporting construction quality and conformance with contract documents. This section outlines the general procedures that will be followed for the identification, use, handling, filing, storage, and disposition of QC records.

### **7.10.1 Responsibility**

The QC Officer will verify that required records are prepared as work is performed to provide documented evidence of the quality of items, services, and activities. Records will be consistent with applicable codes, work plans, and contracts, and will be adequate for use in management of the project. Inspection and test records will identify the inspector or data recorder, the type of observation, the results, and the acceptability or action taken in connection with any deficiency.

### 7.10.2 Requirements

Individual inspections, tests, and observations will be scheduled at predetermined points in the project. The proper documentation to record these activities will be compiled by the QC Officer or another designated QC Team member and discussed with the testing personnel before execution. The QC Officer or another designated QC Team member will monitor the inspection process and document progress and observations in the QC logbook. This information will be summarized in the DQCRs provided to the COR, Site Superintendent, and CQCSM.

**7.10.2.1 Reports and Records.** The QC Officer will maintain current records providing factual evidence that required QC activities and/or tests have been performed. These records will also address the work of subcontractors and suppliers and will be on an acceptable form that includes, at a minimum, the following information:

- ▲ Contractor/Subcontractor and their area of responsibility
- ▲ Description of equipment used and number of hours used, idle, or repaired
- ▲ Work performed, including a description and a sketch, if necessary
- ▲ Test and/or control activities performed with results and references to Work Plan requirements. The control phase will be identified (preparatory, initial, or follow-up). Any deficiencies will be noted along with corrective actions
- ▲ Quantity of materials received at the site with statement as to acceptability and storage
- ▲ Submittals reviewed and action taken
- ▲ Offsite surveillance activities and actions taken
- ▲ Job safety evaluations stating what was checked, instructions, corrective actions, and results
- ▲ Contractor's statement verifying compliance with contract documents.

These records will cover both conforming and deficient features and will include a statement that the equipment and materials incorporated in the work as well as the workmanship comply with the contract requirements. The reports will be signed and dated by the QC Officer. The report from the QC Officer will include copies of test reports and copies of reports prepared by all QC personnel.

**7.10.2.2 Forms.** Construction QC forms will be used for visual observations, inspections, and testing. The QC Officer or another designated QC Team member will witness all required field testing and sign the appropriate forms for the work to be accepted. Inspection and testing forms will identify the equipment, materials, and installations involved, and checklists will be marked where applicable. Locations, orientations, elevations, test parameters, test results, and other comments will be included

on the forms as appropriate. Forms will be dated and signed by the person performing the observation, inspection, or test. Forms will also be signed and dated by the QC Officer and submitted to the Site Superintendent for approval.

The QC Officer will document all QC activity on the appropriate forms. Appendix E contains the forms for the DQCR, Field Variance Report (FVR), List of Outstanding Deficiencies, NCR, Submittal Register and Transmittal Forms, CQC Test Report List, Record of Preparatory and Initial Inspections, Preparatory Inspection Outline, Initial and Follow-up Phase Checklist, and Field Inspection Report. Additional forms may be used as necessary and as approved by the CQCSM.

CAPE shall maintain all required documents as per U.S. EPA regulations and obtain permission from the U.S. EPA before disposing of any records.

**7.10.2.3 Control.** A standard records management and document control system will be used. The PM will be responsible for implementing the system for the entire project and the Site Superintendent will be responsible for implementing these practices in the field.

Elements of the records management system include:

- ▲ Master index system
- ▲ Logging and issuing of document numbers
- ▲ Method to determine status of documents in progress
- ▲ Standardized procedures/forms
- ▲ Proper storage of documents
- ▲ Retrieval
- ▲ Archiving.

Elements of the document control system include:

- ▲ Logging and issuing of control numbers
- ▲ Assignment of a central control person
- ▲ Controlled access.

Project records will be maintained in a safe and retrievable manner until project closeout. Physical and electromagnetic protection will be provided until records are delivered to the client or archived. Archived records will be protected from loss or damage for 5 years or as specified by the government.

## **8.0 DOCUMENTATION AND REPORTING**

### **8.1 Construction Completion Report**

Following the completion of all construction work, CAPE will prepare a construction completion report. This report will address site-specific information including the following:

- ▲ A cover letter signed by the PGM certifying that all services were performed according to the project requirements
- ▲ A synopsis/written narrative report describing site activities including quantities of materials removed, sample collection data, and certification that the work was completed in accordance with the Work Plan, which includes the CQC Plan, SAP, and SSHP
- ▲ Explanation and description of any modifications to the Work Plan or any other plans and why the modifications were necessary
- ▲ Results of the field screening
- ▲ Information demonstrating that the approved plans were implemented and the cleanup criteria have been met
- ▲ Summary of significant activities that occurred during construction, including problems that were encountered and how they were addressed
- ▲ Copies of all analyses performed including QC data and sample validation
- ▲ Information on who sampled, analyzed, transported, and accepted all wastes encountered and copies of manifests, as applicable
- ▲ As-built scaled drawings that depict the site
- ▲ A CQC summary
- ▲ Summary of total project costs
- ▲ Preconstruction, progress, and postconstruction photographs
- ▲ Property management tracking records, as maintained by project engineer Will Torres
- ▲ Separate closeout documentation for each property in hardcopy and electronic format.

## 8.2 Weekly Progress Meetings

While field activities are in progress, CAPE will participate in weekly progress meetings with the USACE Representative. The standard agenda will include the following:

- ▲ A description and status of the project and cost report
- ▲ Summaries of all findings and description of significant activities and work completed or accomplished
- ▲ Summaries of all changes made during the reporting period (e.g., personnel, documentation, construction)

- ▲ Summaries of all problems encountered or anticipated problems prevented during the reporting period
- ▲ Actions taken to rectify/prevent problems
- ▲ Problems resolved
- ▲ Changes to key project personnel
- ▲ Projected work for the next reporting period
- ▲ Deliverables submitted
- ▲ Schedule updates.

### 8.3 **Daily Quality Control Reports**

A DQCR will be completed daily during field activities to document all project activities. The report will cover both conforming and nonconforming work and materials and, where applicable, will include a statement of certification that all materials, supplies, and work accepted that day comply with the contract requirements. The QC Officer or authorized designee will sign the DQCR to validate the certification. The DQCR will include, but not be limited to, the following:

- ▲ Type and number of control activities
- ▲ Results of inspections and tests
- ▲ Types of defects/causes for rejection, if any
- ▲ Corrective actions proposed/taken, if any
- ▲ Number of personnel working on project by trade
- ▲ Types and quantities of equipment on site
- ▲ Types and quantities of materials delivered to site
- ▲ Weather conditions/long-term forecast
- ▲ Delays and their causes, if any
- ▲ Verbal instructions
- ▲ Samples collected
- ▲ Waste transportation and disposal summary
- ▲ Visitors to the site such as regulators, politicians, reporters, etc.
- ▲ Health and safety activities
- ▲ Daily and cumulative safety hours.

## 9.0 **PROJECT SCHEDULE**

Appendix F presents a chart showing the project schedule. Before mobilization, the proposed construction schedule will be reviewed with the appropriate USACE personnel to identify the best time frame to complete the work and to identify access limitations, if any. Work will be scheduled to minimize delays and expedited to determine if additional funding is needed to complete the project.

## 10.0 REFERENCES

Foster Wheeler Environmental, 2001. *Final Remedial Investigation Report for Operable Unit 1 (OU-1) Off-site Soils for Cornell-Dubilier Electronics Superfund Site, South Plainfield Middlesex County, New Jersey*. August.

U.S. Environmental Protection Agency (EPA), 2000. *EPA Guidance for Data Quality Objectives Process, EPA QA/G-4, EPA 600/R 96-055*.

60

60

NEW  
JERSEY



QUADRANGLE LOCATION



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REVISIONS:

No.	Date	Remarks



U. S. Army Corps  
of Engineers  
KANSAS CITY DISTRICT

PROJECT NAME

OU-1 REMEDIAL DESIGN  
CORNELL-DUBILIER ELECTRONICS  
SUPERFUND SITE  
SOUTH PLAINFIELD, NEW JERSEY

SHEET TITLE

SITE LOCATION MAP

CONTRACT NO:  
W912DQ-05-D-0001

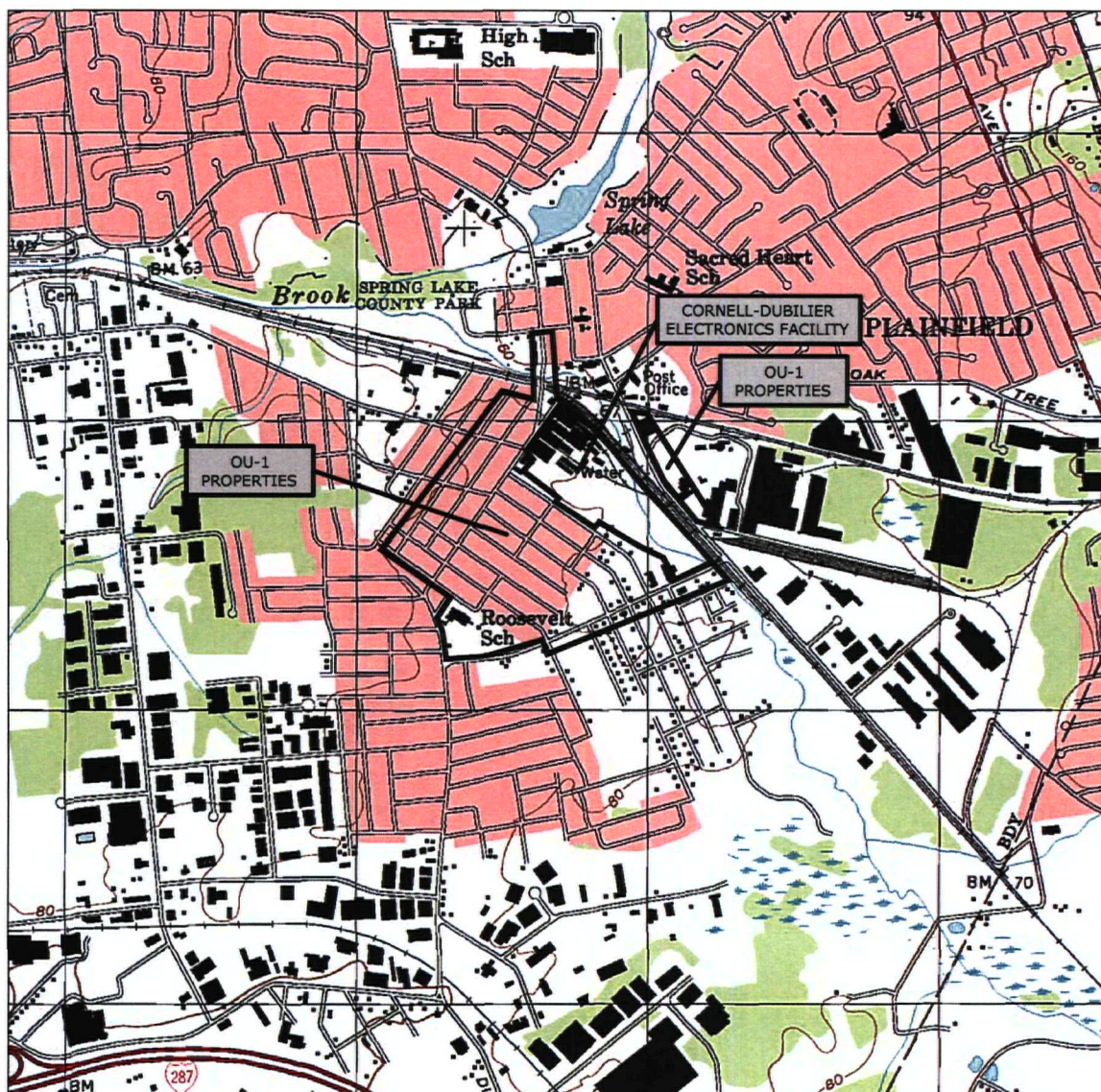
JOB NO:  
50001.001.001.002

CHECKED BY: W.TORRES  
DRAWN BY: B.DAVIS

DATE: JULY 05  
FILE NAME: CDEFIG1

FIGURE:

FIGURE 1



SOURCE: US GEOLOGICAL SURVEY 7.5-MINUTE SERIES TOPOGRAPHIC  
MAP FOR PLAINFIELD, NEW JERSEY (1995).

**FIGURE 1**  
**SITE LOCATION MAP**  
SCALE: 1 : 24,000



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REVISIONS:

No.	Date	Remarks



U. S. Army Corps  
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KANSAS CITY DISTRICT

PROJECT NAME

OU-1 REMEDIAL DESIGN  
CORNELL-DUBILIER ELECTRONICS  
SUPERFUND SITE  
SOUTH PLAINFIELD, NEW JERSEY

SHEET TITLE

CORNELL-DUBILIER ELECTRONICS SITE  
OU-1 PROPERTIES

CONTRACT NO:  
W912DQ-05-D-0001

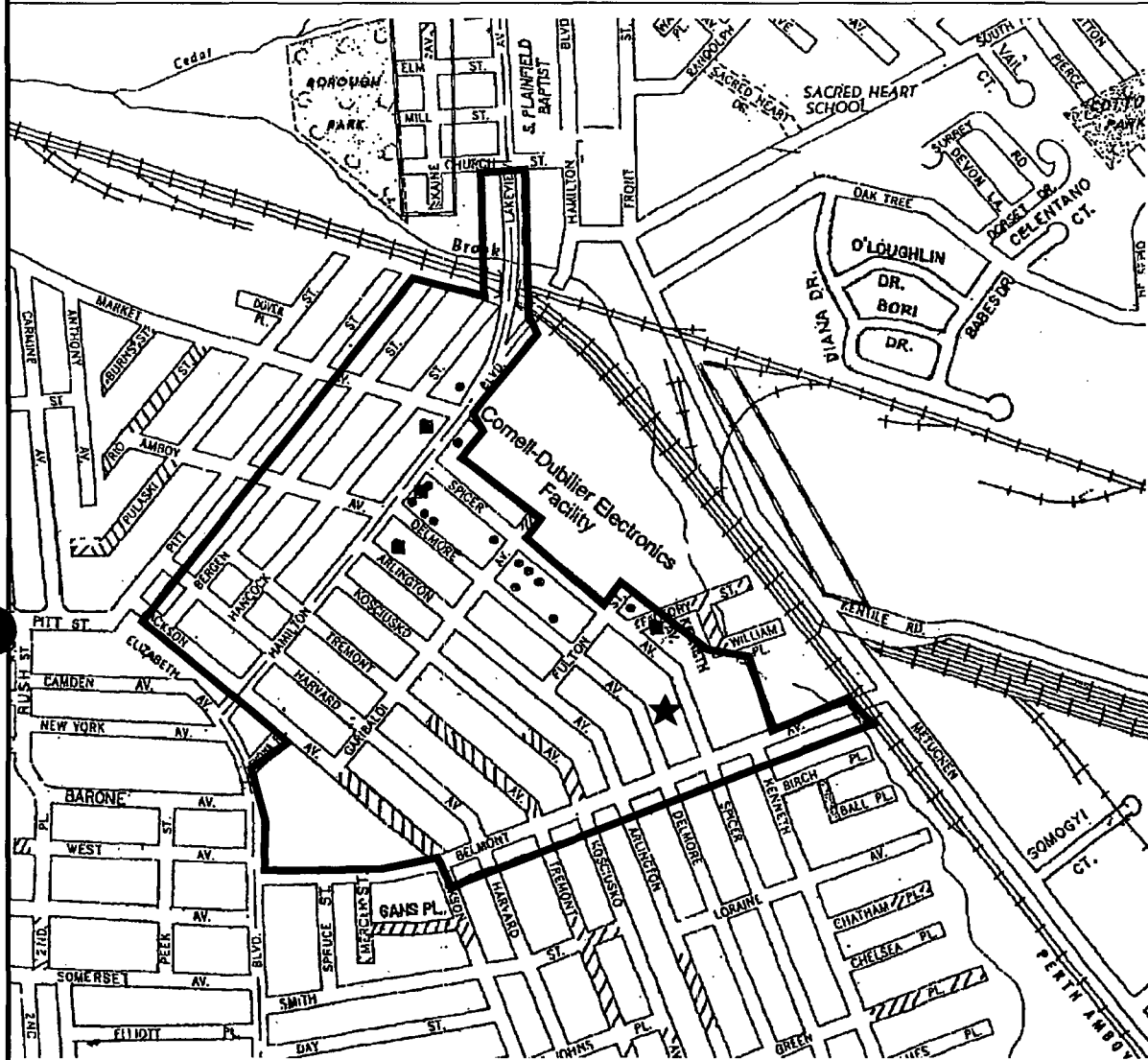
JOB NO:  
50001.001.001.002

CHECKED BY: W.TORRES  
DRAWN BY: B.DAVIS

DATE: JULY 05  
FILE NAME: CDEFIG2

FIGURE:

FIGURE 2



**CORNELL-DUBILIER ELECTRONICS SITE**  
**OU-1 PROPERTIES**  
NOT TO SCALE

**LEGEND**

- PROPERTIES SELECTED FOR  
REMEDIAL ACTION
- PREVIOUSLY REMEDIATED PROPERTIES
- ★ LOCATION OF FIELD TRAILERS AND  
LAYDOWN AREA

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U. S. Army Corps  
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KANSAS CITY DISTRICT

PROJECT NAME

OU-1 REMEDIAL DESIGN  
CORNELL-DUBLER ELECTRONICS  
SUPERFUND SITE  
SOUTH PLAINFIELD, NEW JERSEY

SHEET TITLE

SITE LOCATION MAP  
*Redacted*

CONTRACT NO:  
W912DQ-05-D-0001

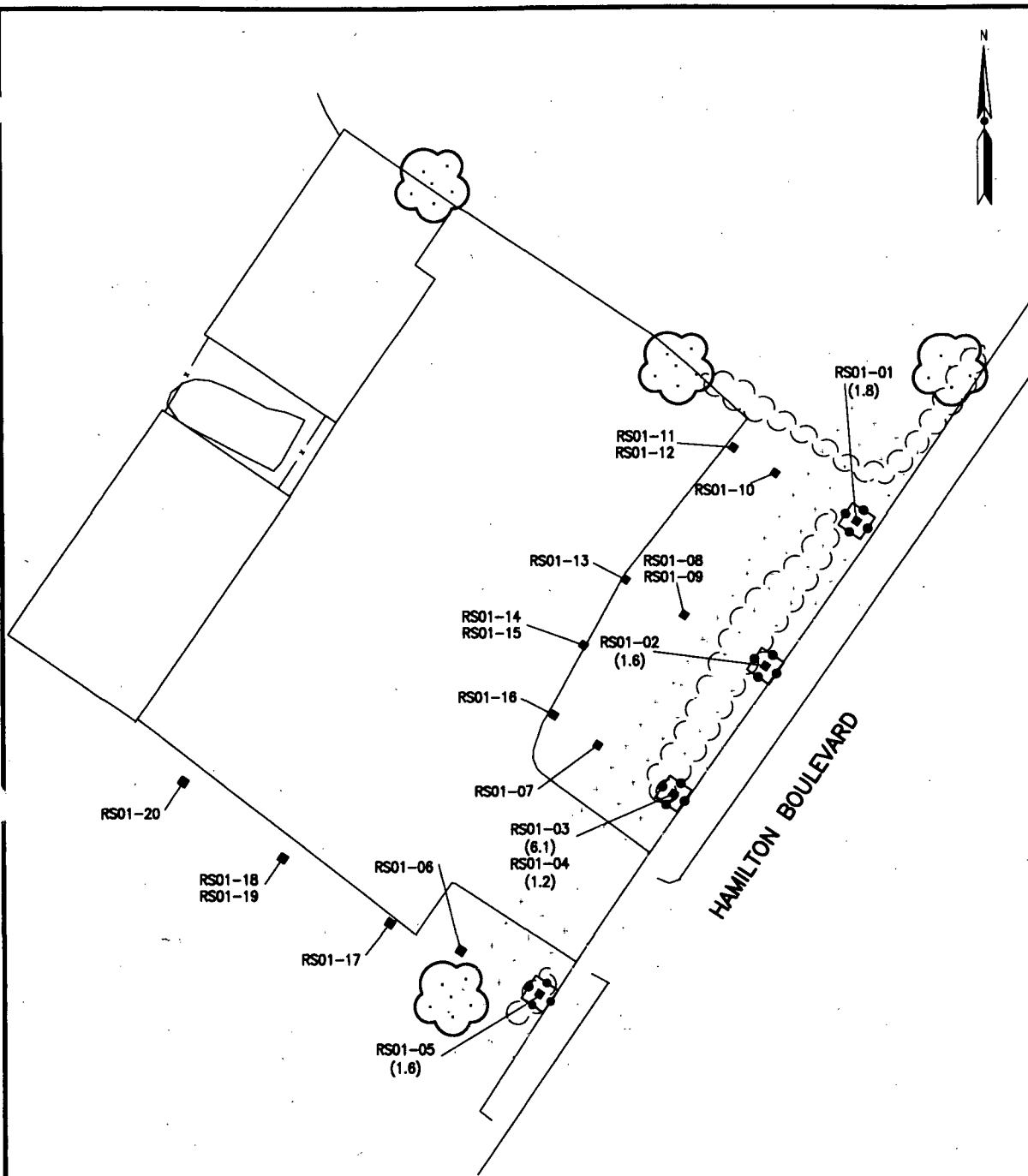
JOB NO:  
50001.001.001.002

CHECKED BY: W.TORRES  
DRAWN BY: B.DAVIS

DATE: JULY 05  
FILE NAME: CDEFIG3

FIGURE:

FIGURE 3



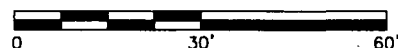
SITE LOCATION MAP - Property 1  
Redacted

SCALE: 1" = 30"

**LEGEND**

- HISTORICAL SAMPLE LOCATION AND CONCENTRATION (ppm)  
RS01-01 / (1.6)
- PROPOSE NEW SAMPLE LOCATION
- 5'x5' GRID (SPACE PERMITTING) AROUND HISTORICAL SAMPLE LOCATION
- × EXTENDED 5 FOOT GRID (IF NEEDED)

GRAPHIC SCALE



SCALE: 1" = 30'-0"

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REVISIONS:

No.	Date	Remarks



U. S. Army Corps  
of Engineers  
KANSAS CITY DISTRICT

PROJECT NAME

OU-1 REMEDIAL DESIGN  
CORNELL-DUBILIER ELECTRONICS  
SUPERFUND SITE  
SOUTH PLAINFIELD, NEW JERSEY

SHEET TITLE

SITE LOCATION MAP  
*Redacted*

CONTRACT NO:  
W912DQ-05-D-0001

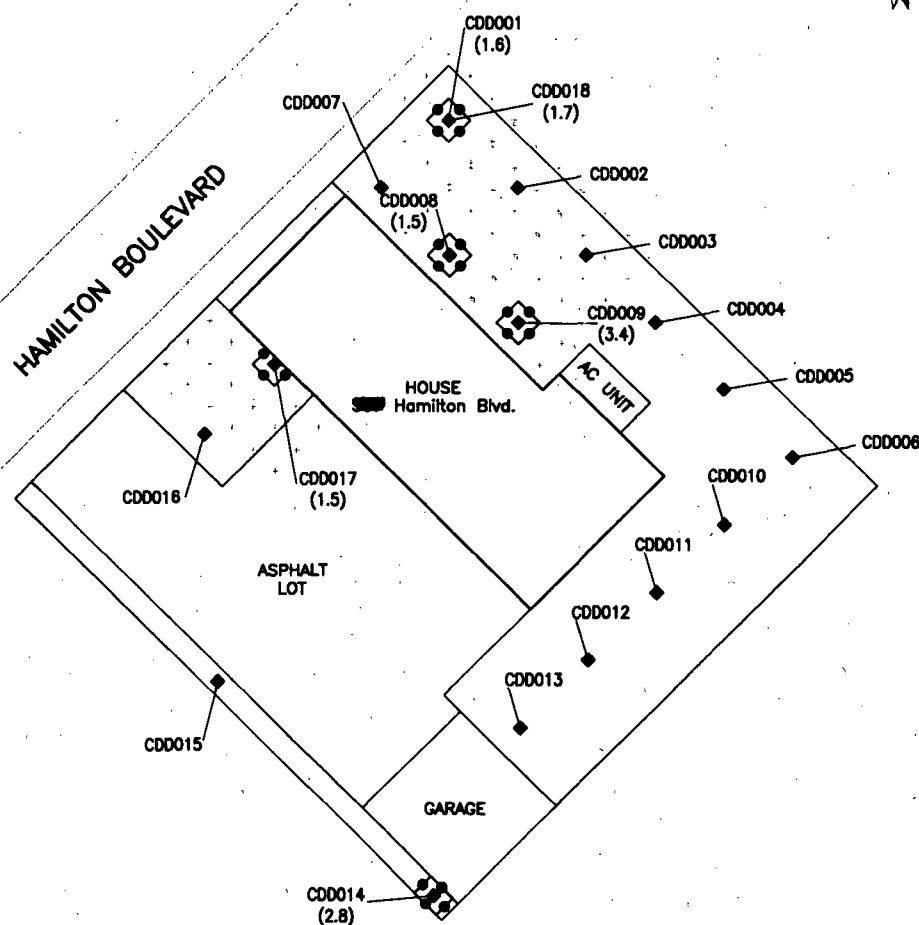
JOB NO:  
50001.001.001.002

CHECKED BY: W.TORRES  
DRAWN BY: B.DAVIS

DATE: JULY 05  
FILE NAME: CDEFIG4

FIGURE:

FIGURE 4



SITE LOCATION MAP

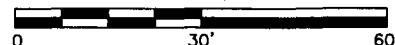
*Redacted*

SCALE: 1" = 30"

LEGEND

- RS01-01/  
(1.6) HISTORICAL SAMPLE LOCATION AND CONCENTRATION (ppm)
- PROPOSE NEW SAMPLE LOCATION
- 5'x5' GRID (SPACE PERMITTING) AROUND HISTORICAL SAMPLE LOCATION
- EXTENDED 5 FOOT GRID (IF NEEDED)

GRAPHIC SCALE



SCALE: 1" = 30'-0"



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REVISIONS:

No.	Date	Remarks



U. S. Army Corps  
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KANSAS CITY DISTRICT

PROJECT NAME

OU-1 REMEDIAL DESIGN  
CORNELL-DUBILIER ELECTRONICS  
SUPERFUND SITE  
SOUTH PLAINFIELD, NEW JERSEY

SHEET TITLE

SITE LOCATION MAP  
*Redacted*

CONTRACT NO:  
W912DQ-05-D-0001

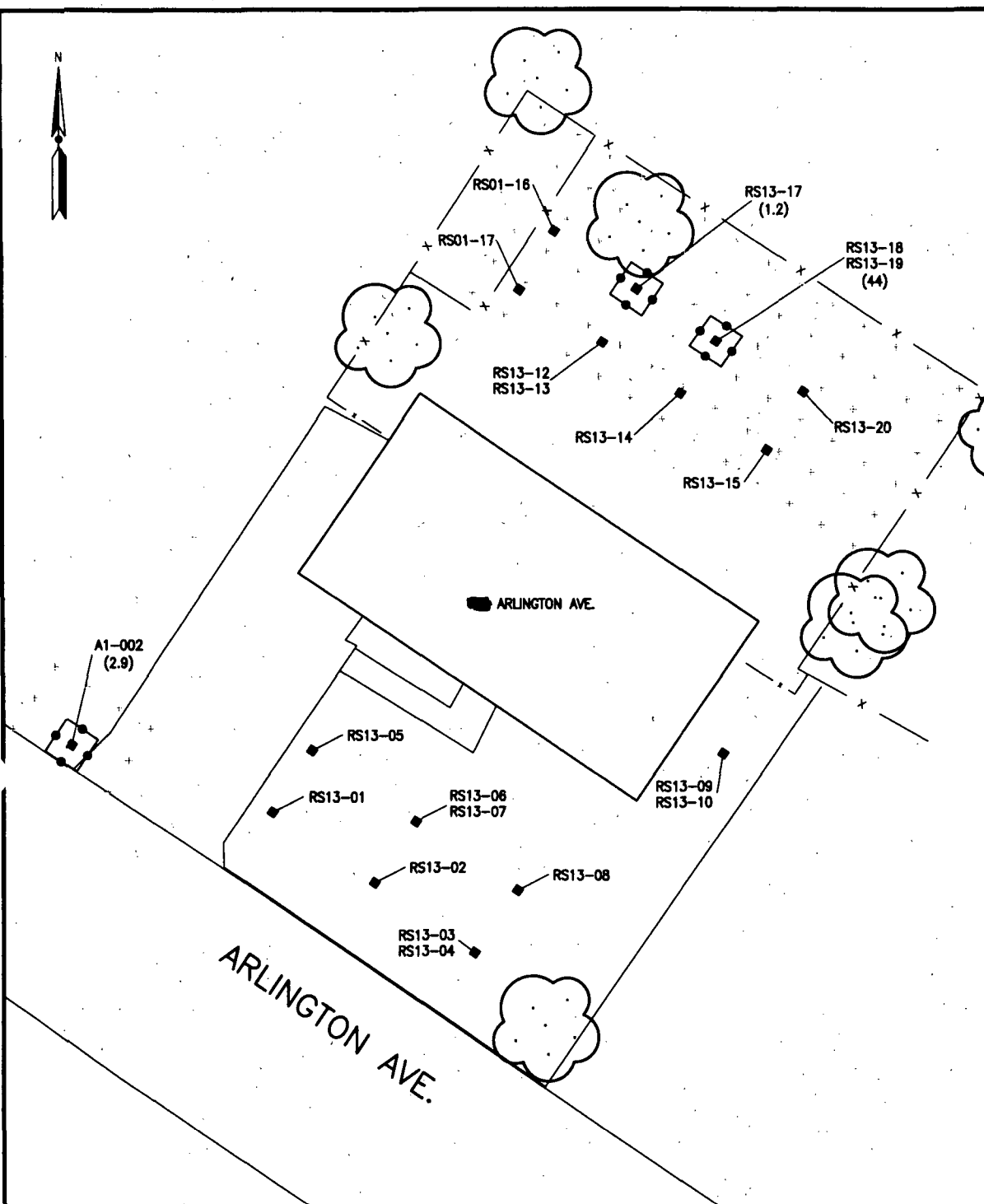
JOB NO:  
50001.001.001.002

CHECKED BY: W.TORRES  
DRAWN BY: B.DAVIS

DATE: JULY 05  
FILE NAME: CDEFIG5

FIGURE:

FIGURE 5



SITE LOCATION MAP

*Redacted*

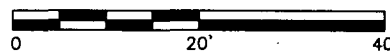
Property 13

SCALE: 1" = 20"

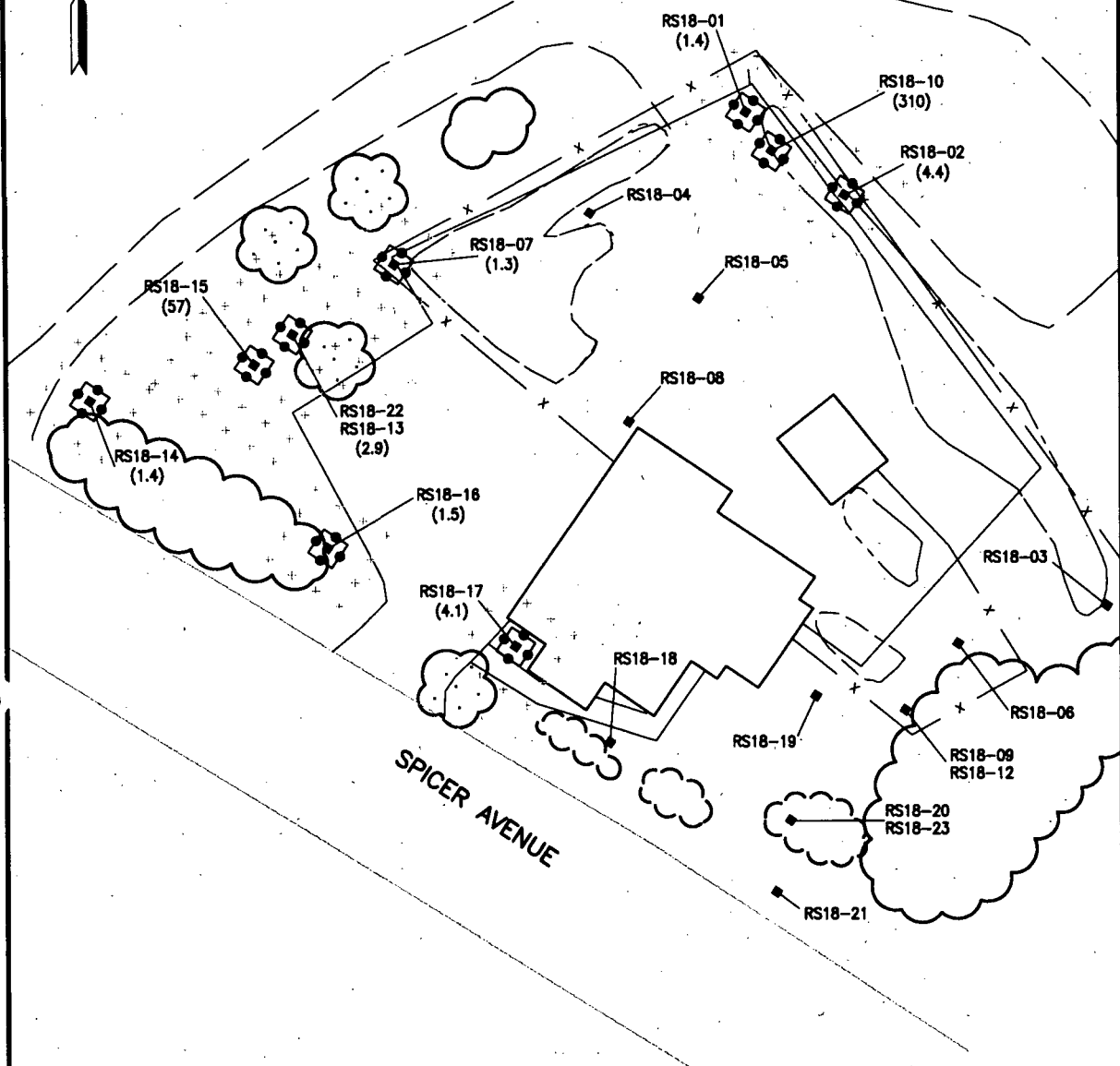
LEGEND

- RS01-01 (1.6) / HISTORICAL SAMPLE LOCATION AND CONCENTRATION (ppm)
- PROPOSE NEW SAMPLE LOCATION
- 5'x5' GRID (SPACE PERMITTING) AROUND HISTORICAL SAMPLE LOCATION
- × EXTENDED 5 FOOT GRID (IF NEEDED)

GRAPHIC SCALE



SCALE: 1" = 20'-0"



SITE LOCATION MAP

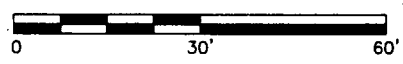
Redacted Property 18  
OFFICE BUILDING

SCALE: 1" = 30'

LEGEND

- RS01-01/  
(1.8) HISTORICAL SAMPLE LOCATION  
AND CONCENTRATION (ppm)
- PROPOSE NEW SAMPLE LOCATION
- 5'x5' GRID (SPACE PERMITTING)  
AROUND HISTORICAL SAMPLE LOCATION
- × EXTENDED 5 FOOT GRID (IF NEEDED)

GRAPHIC SCALE



SCALE: 1" = 30'-0"

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REVISIONS:

No.	Date	Remarks



U. S. Army Corps  
of Engineers  
KANSAS CITY DISTRICT

PROJECT NAME

OU-1 REMEDIAL DESIGN  
CORNELL-DUBILIER ELECTRONICS  
SUPERFUND SITE  
SOUTH PLAINFIELD, NEW JERSEY

SHEET TITLE

SITE LOCATION MAP  
*Redacted*

CONTRACT NO:  
W912DQ-05-D-0001

JOB NO:  
50001.001.001.002

CHECKED BY: W.TORRES DRAWN BY: B.DAVIS

DATE: JULY 05 FILE NAME: CDEFIG8

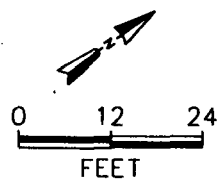
FIGURE:

FIGURE 6



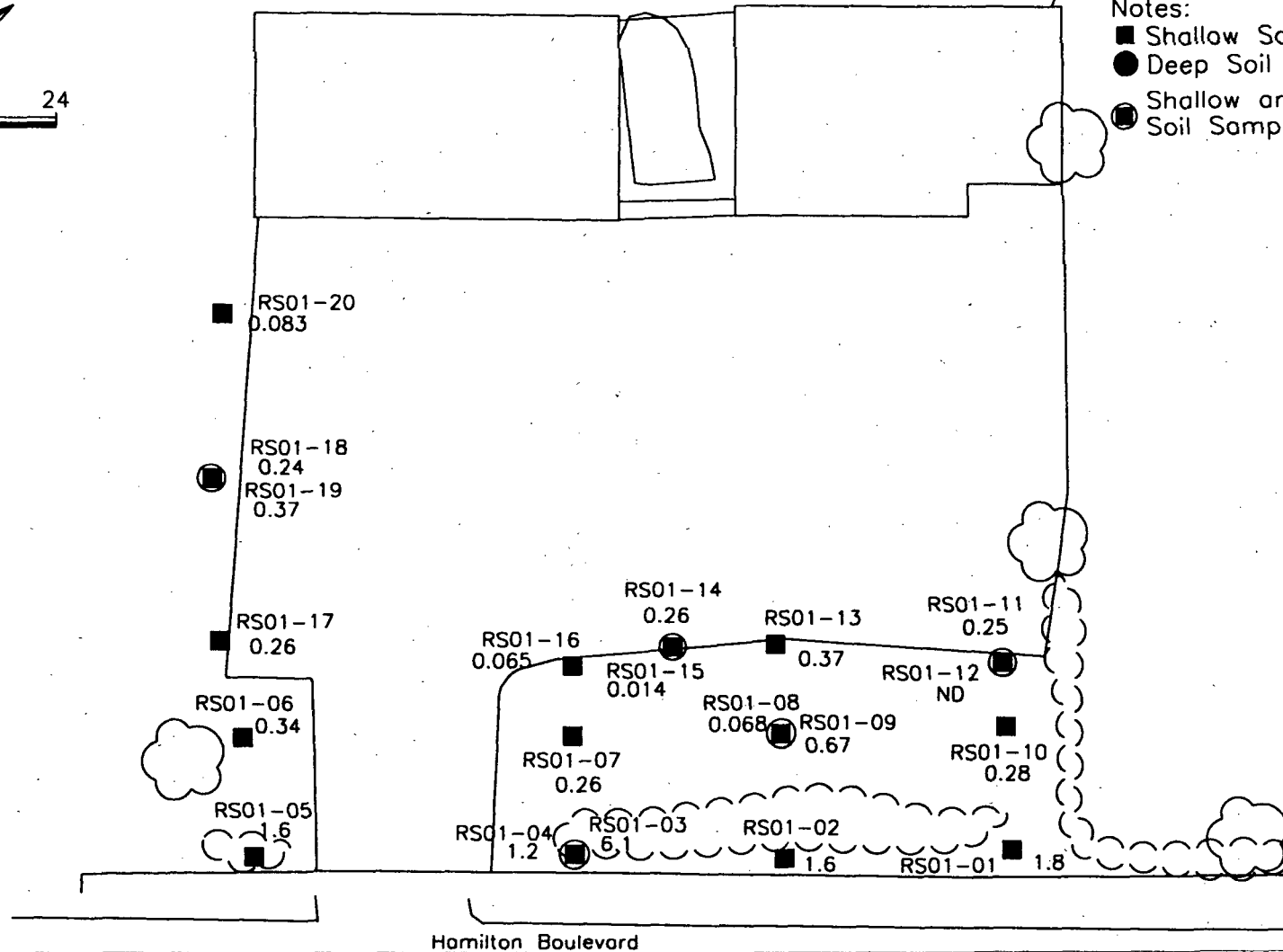
TABLE A1  
PCBs Detected at Property RS01  
Cornell-Dubilier Electronics Superfund Site  
PROPERTY 1 - [Redacted]

Sample ID	Date	Depth (in.)	Aroclor 1016 (ug/kg)	Aroclor 1221 (ug/kg)	Aroclor 1232 (ug/kg)	Aroclor 1242 (ug/kg)	Aroclor 1248 (ug/kg)	Aroclor 1254 (ug/kg)	Aroclor 1260 (ug/kg)	Total PCBs (mg/kg)
CDE-RS01-01	6/12/2000	0-2	40 U	80 U	40 U	40 U	40 U	1800 D	40 U	1.8
CDE-RS01-02	6/12/2000	0-2	42 U	84 U	42 U	42 U	42 U	1600 D	42 U	1.6
CDE-RS01-03	6/12/2000	0-2	41 U	81 U	41 U	41 U	41 U	6100 JD	41 U	6.1
CDE-RS01-04	6/12/2000	16-18	38 U	76 U	38 U	38 U	38 U	1200 JD	38 U	1.2
CDE-RS01-05	6/12/2000	0-2	42 U	84 U	42 U	42 U	42 U	1600 JD	42 U	1.6
CDE-RS01-06	6/12/2000	0-2	41 U	81 U	41 U	41 U	41 U	340 P	41 U	0.34
CDE-RS01-07	6/12/2000	0-2	40 U	80 U	40 U	40 U	40 U	210	40 U	0.21
CDE-RS01-97	Duplicate of CDE-RS01-07		40 U	80 U	40 U	40 U	40 U	260	40 U	0.26
CDE-RS01-08	6/12/2000	0-2	39 U	79 U	39 U	39 U	39 U	68 P	39 U	0.068
CDE-RS01-09	6/12/2000	16-18	43 U	86 U	43 U	43 U	43 U	670 P	43 U	0.67
CDE-RS01-10	6/12/2000	0-2	39 U	79 U	39 U	39 U	39 U	280 P	39 U	0.28
CDE-RS01-11	6/12/2000	0-2	43 U	85 U	43 U	43 U	43 U	250	43 U	0.25
CDE-RS01-12	6/12/2000	16-18	39 U	78 U	39 U	39 U	39 U	39 U	39 U	U
CDE-RS01-13	6/12/2000	0-2	41 U	82 U	41 U	41 U	41 U	370 JP	41 U	0.37
CDE-RS01-14	6/12/2000	0-2	38 U	76 U	38 U	38 U	38 U	260	38 U	0.26
CDE-RS01-15	6/12/2000	16-18	39 U	79 U	39 U	39 U	39 U	14 JP	39 U	0.014
CDE-RS01-16	6/12/2000	0-2	36 U	72 U	36 U	36 U	36 U	65	36 U	0.065
CDE-RS01-17	6/12/2000	0-2	38 U	76 U	38 U	38 U	38 U	260	38 U	0.26
CDE-RS01-18	6/12/2000	0-2	42 U	83 U	42 U	42 U	42 U	240	42 U	0.24
CDE-RS01-19	6/12/2000	16-18	41 U	82 U	41 U	41 U	41 U	370 B	41 U	0.37
CDE-RS01-20	6/12/2000	0-2	41 U	82 U	41 U	41 U	41 U	83 JP	41 U	0.083



Notes:

- Shallow Soil Sample
- Deep Soil Sample
- ◐ Shallow and Deep Soil Samples



FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE:

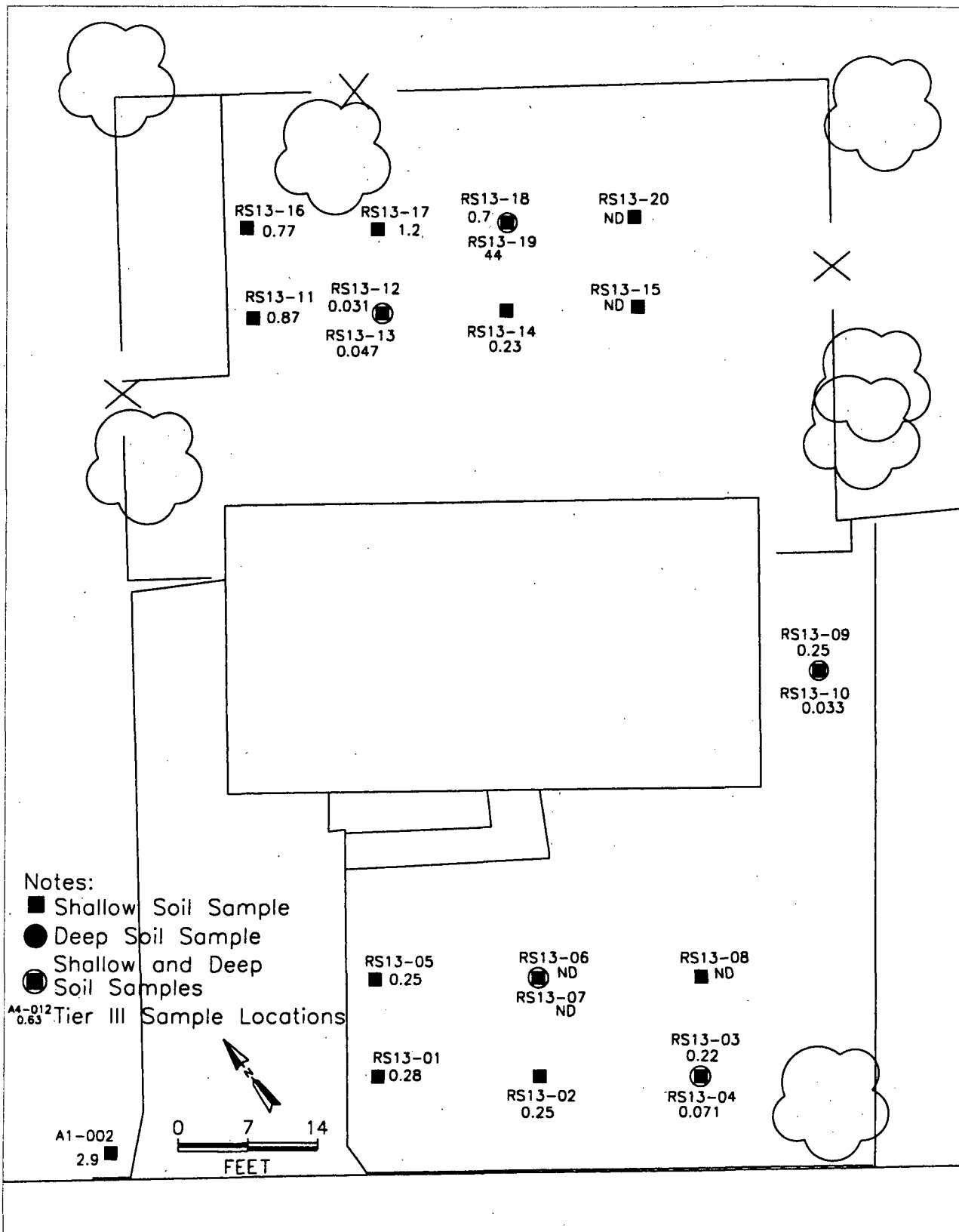
Total PCBs (mg/kg)  
 Property 1 (Redacted)  
 Cornell-Dubilier Electronics Superfund Site, OU-1

DWN:	DES.:	PROJECT NO.:
CTS		
CHKD:	APPD:	FIGURE NO.:
DATE:	REV.:	2-1
06/01/01	1	

1945.1018

TABLE A2  
PCBs Detected at Property RS013  
Cornell-Dubilier Electronics Superfund Site  
PROPERTY 13 - *Redacted*

Sample ID	Date	Depth (in.)	Aroclor 1016 (ug/kg)	Aroclor 1221 (ug/kg)	Aroclor 1232 (ug/kg)	Aroclor 1242 (ug/kg)	Aroclor 1248 (ug/kg)	Aroclor 1254 (ug/kg)	Aroclor 1260 (ug/kg)	Total PCBs (mg/kg)
CDE-RS13-01	6/20/2000	0-2	200 U	400 U	200 U	200 U	200 U	280 PD	200 U	0.28
CDE-RS13-02	6/20/2000	0-2	190 U	380 U	190 U	190 U	190 U	250 PD	190 U	0.25
CDE-RS13-03	6/20/2000	0-2	200 U	400 U	200 U	200 U	200 U	220 PD	200 U	0.22
CDE-RS13-04	6/20/2000	16-18	35 U	71 U	35 U	35 U	35 U	71	35 U	0.071
CDE-RS13-05	6/20/2000	0-2	210 U	420 U	210 U	210 U	210 U	250 PD	210 U	0.25
CDE-RS13-06	6/20/2000	0-2	40 U	79 U	40 U	40 U	40 U	40 U	40 U	U
CDE-RS13-07	6/20/2000	16-18	37 UJ	74 UJ	37 UJ	37 UJ	37 UJ	37 UJ	37 UJ	U
CDE-RS13-97	Duplicate of CDE-RS13-07		37 U	74 U	37 U	37 U	37 U	37 U	37 U	U
CDE-RS13-08	6/20/2000	0-2	200 U	410 U	200 U	200 U	200 U	200 U	200 U	U
CDE-RS13-09	6/20/2000	0-2	200 U	400 U	200 U	200 U	200 U	250 PD	200 U	0.25
CDE-RS13-10	6/20/2000	16-18	38 UJ	76 UJ	38 UJ	38 UJ	38 UJ	33 JP	38 UJ	0.033
CDE-RS13-11	6/20/2000	0-2	200 U	400 U	200 U	200 U	200 U	200 U	870 PD	0.87
CDE-RS13-12	6/20/2000	0-2	41 U	82 U	41 U	41 U	41 U	41 U	31 J	0.031
CDE-RS13-13	6/20/2000	16-18	41 U	82 U	41 U	41 U	41 U	40 J	41 U	0.04
CDE-RS13-83	Duplicate of CDE-RS13-13		41 U	82 U	41 U	41 U	41 U	47	41 U	0.047
CDE-RS13-14	6/20/2000	0-2	200 U	410 U	200 U	200 U	200 U	200 U	230 PD	0.23
CDE-RS13-15	6/20/2000	0-2	200 U	390 U	200 U	200 U	200 U	200 U	200 U	U
CDE-RS13-16	6/20/2000	0-2	200 U	400 U	200 U	200 U	200 U	200 U	770 D	0.77
CDE-RS13-17	6/20/2000	0-2	390 U	780 U	390 U	390 U	390 U	390 U	1200 PD	1.2
CDE-RS13-18	6/20/2000	0-2	210 U	420 U	210 U	210 U	210 U	210 U	700 PD	0.7
CDE-RS13-19	6/20/2000	16-18	4400 U	8900 U	4400 U	4400 U	4400 U	4400 U	44000 D	44
CDE-RS13-20	6/20/2000	0-2	190 U	380 U	190 U	190 U	190 U	190 U	190 U	U



FOSTER WHEELER ENVIRONMENTAL CORPORATION

**TITLE:**

Total PCBs (mg/kg)

Property 13 *Redacted*

Cornell-Dubilier Electronics Superfund Site, OU-1

**DWN:**

CTS

**CHKD:**

**DATE:**

06/01/01

**DES:**

**APPD:**

**REV:**

1

**PROJECT NO.:**

1945.1018

**FIGURE NO.:**

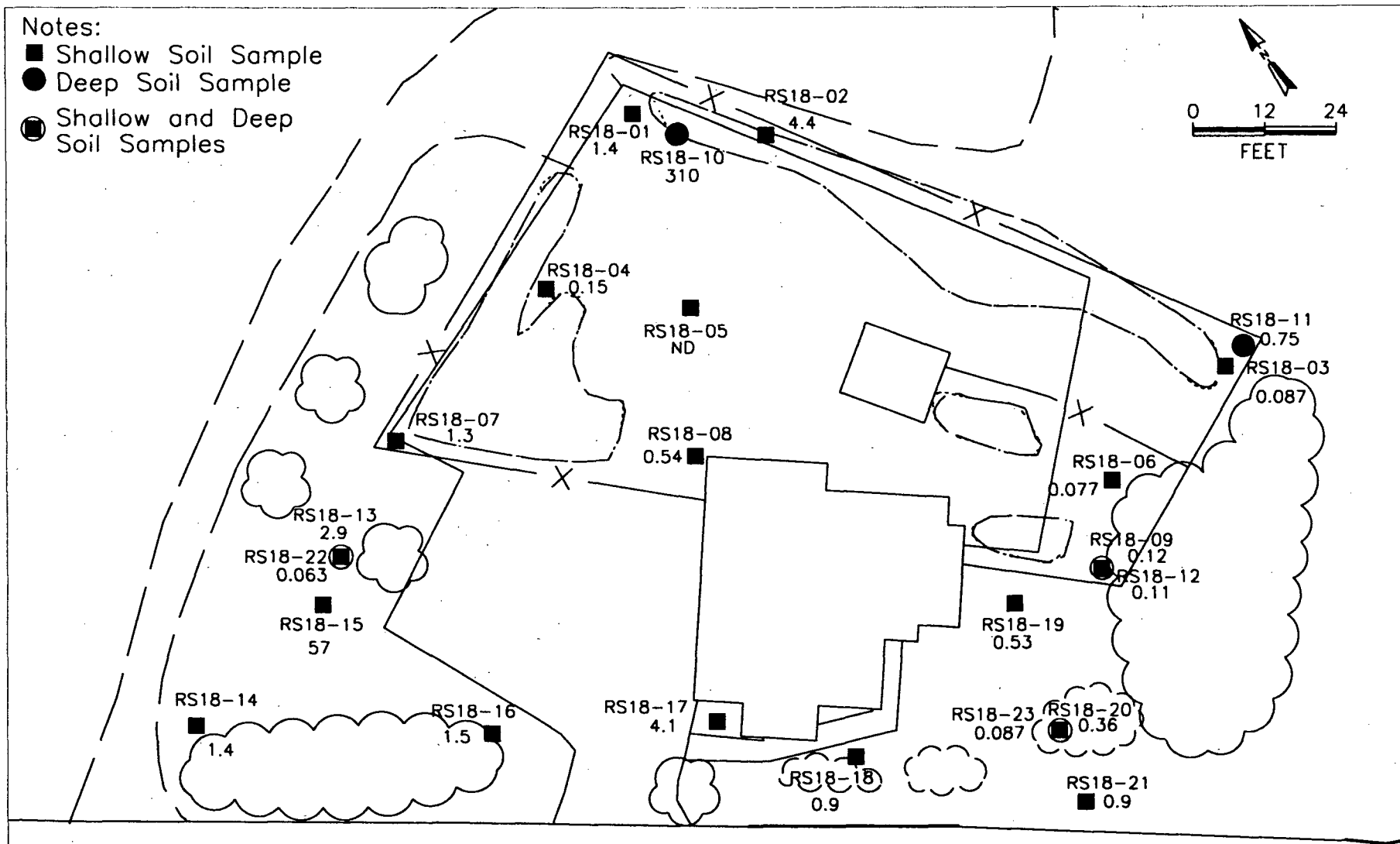
2-13

TABLE A3  
PCBs Detected at Property RS018  
Cornell-Dubilier Electronics Superfund Site  
PROPERTY 18 - *Redacted*

Sample ID	Date	Depth (in.)	Aroclor 1016 (ug/kg)	Aroclor 1221 (ug/kg)	Aroclor 1232 (ug/kg)	Aroclor 1242 (ug/kg)	Aroclor 1248 (ug/kg)	Aroclor 1254 (ug/kg)	Aroclor 1260 (ug/kg)	Total PCBs (mg/kg)
CDE-RS18-01	6/22/2000	0-2	190 U	380 U	190 U	190 U	190 U	1400 D	190 U	1.4
CDE-RS18-02	6/22/2000	0-2	740 U	1500 U	740 U	740 U	740 U	4400 D	740 U	4.4
CDE-RS18-03	6/22/2000	0-2	40 U	80 U	40 U	40 U	40 U	87	40 U	0.087
CDE-RS18-04	6/22/2000	0-2	37 U	73 U	37 U	37 U	37 U	150	37 U	0.15
CDE-RS18-05	6/22/2000	0-2	39 U	78 U	39 U	39 U	39 U	39 U	39 U	U
CDE-RS18-06	6/22/2000	0-2	39 U	78 U	39 U	39 U	39 U	77 J	39 U	0.077
CDE-RS18-07	6/22/2000	0-2	190 U	380 U	190 U	190 U	190 U	1300 D	190 U	1.3
CDE-RS18-08	6/22/2000	0-2	200 U	390 U	200 U	200 U	200 U	540 D	200 U	0.54
CDE-RS18-09	6/22/2000	0-2	40 U	79 U	40 U	40 U	40 U	120	40 U	0.12
CDE-RS18-10	6/22/2000	16-18	44000 U	89000 U	44000 U	44000 U	44000 U	230000 D	44000 U	230
CDE-RS18-80	Duplicate of CDE-RS18-10		45000 U	90000 U	45000 U	45000 U	45000 U	310000 D	45000 U	310
CDE-RS18-11	6/22/2000	16-18	190 U	380 U	190 U	190 U	190 U	750 D	190 U	0.75
CDE-RS18-12	6/22/2000	16-18	40 U	80 U	40 U	40 U	40 U	110	40 U	0.11
CDE-RS18-13	6/22/2000	0-2	760 U	1500 U	760 U	760 U	760 U	2900 D	760 U	2.9
CDE-RS18-14	6/22/2000	0-2	360 U	730 U	360 U	360 U	360 U	1400 JD	360 U	1.4
CDE-RS18-15	6/22/2000	0-2	19000 U	39000 U	19000 U	19000 U	19000 U	57000 D	19000 U	57
CDE-RS18-16	6/22/2000	0-2	390 U	770 U	390 U	390 U	390 U	1500 D	390 U	1.5
CDE-RS18-17	6/22/2000	0-2	780 U	1600 U	780 U	780 U	780 U	4100 JD	780 U	4.1
CDE-RS18-18	6/22/2000	0-2	200 U	400 U	200 U	200 U	200 U	900 D	200 U	0.9
CDE-RS18-19	6/22/2000	0-2	210 U	410 U	210 U	210 U	210 U	530 D	210 U	0.53
CDE-RS18-20	6/22/2000	0-2	200 U	390 U	200 U	200 U	200 U	360 D	200 U	0.36
CDE-RS18-21	6/22/2000	0-2	190 U	380 U	190 U	190 U	190 U	900 D	190 U	0.9
CDE-RS18-22	6/22/2000	16-18	37 U	74 U	37 U	37 U	37 U	63	37 U	0.063
CDE-RS18-23	6/22/2000	16-18	180 U	370 U	180 U	180 U	180 U	87 JD	180 U	0.087

Notes:

- Shallow Soil Sample
- Deep Soil Sample
- ◐ Shallow and Deep Soil Samples



FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE:

Total PCBs (mg/kg)

Property 18 ( *Redacted* )

Cornell-Dubilier Electronics Superfund Site, OU-1

DWN:

CTS

CHKD:

DATE:

06/01/01

DES.:

APPD:

REV.:

1

PROJECT NO.:

1945.1018

FIGURE NO.:

2-18

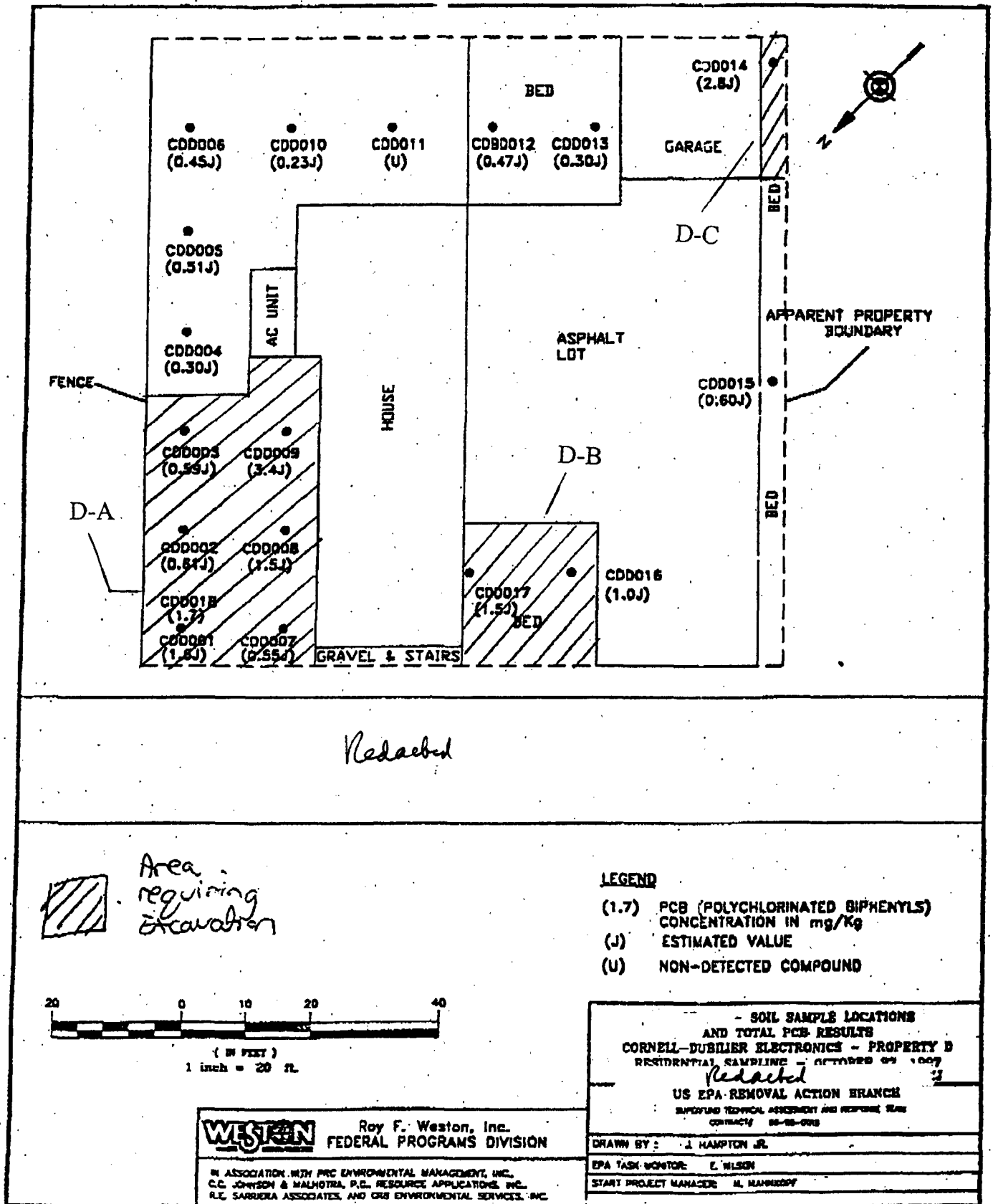
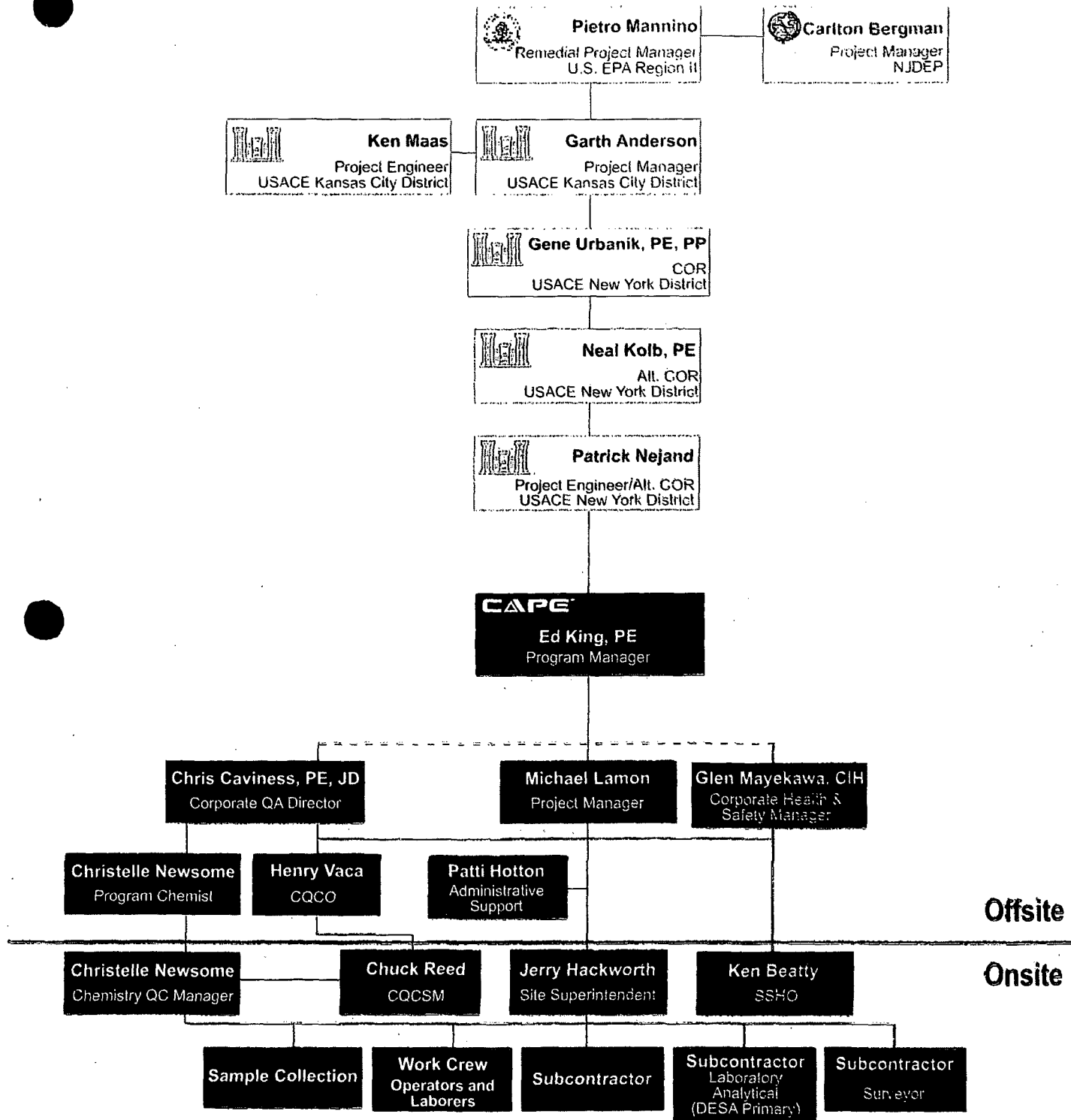


Figure 4





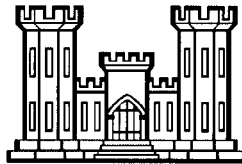


**SAMPLING AND ANALYSIS PLAN**  
**PART 1 - FIELD SAMPLING PLAN**  
**PART 2 - QUALITY ASSURANCE PROJECT PLAN**

**REMEDIAL DESIGN**  
**FINAL**  
**OPERABLE UNIT 1**  
**CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE**  
**SOUTH PLAINFIELD, NEW JERSEY**

**Contract Number W912DQ-05-D-0001**  
**Task Order Number 001**

*Prepared for:*



**U.S. ARMY CORPS OF ENGINEERS**  
**KANSAS CITY DISTRICT**  
**Federal Building 601 E. 12<sup>th</sup> Street**  
**Kansas City, Missouri 64106-2896**

*Prepared by:*

**CAPE<sup>SM</sup>**

**CAPE**  
**180 Gordon Drive, Suite 102**  
**Exton, Pennsylvania 19341**

**CAPE Project Number 50001.001**  
**October 2005**

**SAMPLING AND ANALYSIS PLAN**

**PART 1 - FIELD SAMPLING PLAN**

**REMEDIAL DESIGN**

**FINAL**

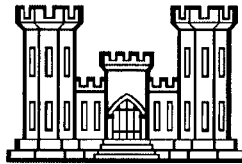
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**CAPE Project Number 50001.001  
October 2005**

**SAMPLING AND ANALYSIS PLAN**

**PART I - FIELD SAMPLING PLAN**

**REMEDIAL DESIGN**

**FINAL**

**OPERABLE UNIT 1**

**CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE  
SOUTH PLAINFIELD, NEW JERSEY**

**Contract Number W912DQ-05-D-0001**

**Task Order 001**

**October 2005**

The following Plan has been prepared in response to a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Record of Decision (ROD) and the signatories below have reviewed and approved the plan for compliance with project requirements.

*Michael Lamon*

10/26/05

Approved by: \_\_\_\_\_

Michael Lamon

\_\_\_\_\_  
Date

Cape Environmental

Project Manager

*Charles Reed*

10/26/05

Approved by: \_\_\_\_\_

Charles Reed

\_\_\_\_\_  
Date

Cape Environmental

CQCSM

*Christelle Newsome*

10/26/05

Approved by: \_\_\_\_\_

Christelle Newsome

\_\_\_\_\_  
Date

Cape Environmental

Chemical Quality Control Officer

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- 1 Chain-of-Custody Form and Instructions, Example Sample Label, Example Custody Seal

## LIST OF ABBREVIATIONS AND ACRONYMS

ASTM	American Society for Testing and Materials
bgs	below ground surface
CDE	Cornell-Dubilier Electronics
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
ChQCM	Chemical Quality Control Manager
CHSM	Corporate Health and Safety Manager
CIH	Certified Industrial Hygienist
CLP	Contract Laboratory Program
COC	contaminants of concern
CQC	Contractor Quality Control
CQCSM	Contractor Quality Control System Manager
DESA	Division of Environmental Science and Assessment
DOD	U.S. Department of Defense
DQCR	Daily Quality Control Report
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
FORMS II Lite™	Field Operations and Records Management System II Lite
FSP	Field Sampling Plan
JD	<i>Juris Doctor</i>
mg/kg	milligrams per kilogram
MS	matrix spike
MSD	matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
NIOSH	National Institute for Occupational Safety and Health
NJ DOT	New Jersey Department of Transportation
NJDEP	New Jersey's Department of Environmental Protection
OU	operable unit
PCB	polychlorinated biphenyl
PE	Professional Engineer
PID	photoionization detector
PGM	Program Manager
PM	Project Manager
PPE	personal protective equipment
ppm	parts per million

QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QCP	Quality Control Plan
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
ROD	record of decision
SAP	Sampling and Analysis Plan
SOW	statement of work
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SVOC	semivolatile organic compound
TO	task order
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound

## 1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) describes the proposed rationale, methods, and procedures for successful completion of the remedial action at the Cornell-Dubilier Electronics Corporation, Inc. (CDE) Superfund site. The CDE site is on the National Priorities List (Comprehensive Environmental Response, Compensation, and Liability Information System [CERCLIS] Identification Number NJD981557879) due to polychlorinated biphenyl (PCB) contamination found in soil and buildings.

The work is being performed by CAPE in accordance with the statement of work (SOW), Contract Number W912DQ-05-D-0001, Contract Task Order (TO) Number 001. This SAP applies only to activities performed by CAPE and its subcontractors under the above-referenced contract and TO. CAPE has prepared this SAP under the U.S. Environmental Protection Agency (EPA) Region 2 guidance, the New Jersey Department of Environmental Protection, and the U.S. Army Corps of Engineers (USACE) Kansas City District requirements. This SAP consists of the Field Sampling Plan (FSP) and the Quality Assurance Project Plan (QAPP).

This project-specific FSP has been prepared to ensure that the data quality objectives (DQOs) specified for this project are met, that the field sampling protocols are documented and reviewed in a consistent manner, and that the data collected are scientifically valid and legally defensible. The FSP provides the overall technical approach, sampling and data collection procedures, and quality assurance (QA) requirements of the work anticipated under this site remedial action project. The FSP will be in possession of the field team collecting the samples.

### 1.1 Purpose and Objectives

The intent of the overall project is to remove contaminated soils to meet established corrective action objectives for the CDE site. All work to be conducted as part of this TO will be conducted in accordance with the project SOW.

For all of the sites associated with this SAP, CAPE will perform the following activities:

- ▲ Set up laydown area
- ▲ Mobilize appropriate equipment to laydown area
- ▲ Coordinate and verify utility clearance activities
- ▲ Survey the properties and locate historic boring locations
- ▲ Perform field screening and laboratory confirmation sampling
- ▲ Collect and analyze precharacterization samples of soil from the excavation areas and submit profile information to appropriate waste disposal facilities
- ▲ Install erosion-control measures where necessary
- ▲ Perform excavation activities

- ▲ Perform perimeter air monitoring
- ▲ Perform restoration and backfill activities
- ▲ Transport waste soil to appropriate disposal facilities using all required tracking and documentation
- ▲ Obtain final disposition documentation from the disposal facility
- ▲ Produce Closeout Reports.

## 1.2 Scope of Work

As previously mentioned, the project consists of the removal of contaminated soils to meet corrective action objectives for the CDE site. CAPE will excavate approximately 750 total cubic yards of PCB-contaminated soil from four vicinity properties designated as Operable Unit (OU)-1 properties, Phase A. The four properties are shown on Figures 3 through 6 of the Work Plan. The outer limits of the excavations will be established based on analytical measurements for PCBs meeting the EPA cleanup goal of 1 part per million (ppm) and is consistent with New Jersey Department of Environmental Protection (NJDEP) technical requirements.

The sampling rationale and required field procedures are addressed in Sections 4.

## 1.3 Supporting Plans

CAPE will review and evaluate existing PCB data collected from these OU-1 properties during previous EPA investigations. The investigations were conducted at various times from June 1997 to May 1998.

## 2.0 **SITE BACKGROUND AND DESCRIPTION**

This section provides a general discussion and historical overview of the CDE superfund site. Location maps for the CDE sites are presented in Figures 1 through 6 of the Work Plan.

### 2.1 Site Location and Background

The Cornell-Dubilier Electronics site consists of approximately 27 acres located at 333 Hamilton Boulevard in South Plainfield, Middlesex County, New Jersey (Figures 1 and 2). CDE manufactured electronic components, including capacitors, at the site from 1936 to 1962. The site is bordered on the northeast by the Bound Brook and the former Lehigh Valley Railroad, Perth Amboy Branch (presently Conrail); to the southeast by the South Plainfield Department of Public Works property, which includes an unnamed tributary to the Bound Brook; to the southwest, across Spicer Avenue, by single-family residential properties; and to the northwest, across Hamilton Boulevard, by mixed residential and commercial properties.

CDE manufactured electronics components at the site from 1936 through 1962. PCBs and chlorinated organic degreasing solvents were used in the manufacturing process. PCBs are a group of chemical compounds consisting of mixtures of numerous chlorinated biphenyl molecules. The compounds differ both in the number and/or position of chlorine atoms attached to the biphenyl rings and in the degree of chlorination, for a total of 209 possible individual compounds (i.e., congeners). For commercial purposes, common mixtures of PCBs were given names/identification numbers, indicating the degree of chlorination, type of formulation, or other properties. For example, one series of mixtures was named "Aroclor," and the specific mixture was then further distinguished by the percentage of chlorine (e.g., Aroclor-1248 contained 48 percent chlorine).

The following subsections provide a brief discussion of the remedial investigation activities performed at the properties selected for remedial action.

#### 2.1.1 *Redacted - Property 1*

Twenty samples (and one duplicate) were collected on this property during the investigation. Aroclor-1254 was the only PCB compound present, and it was detected in 19 of the sample locations (Table A-1, Appendix A, of the Work Plan). Total PCB concentrations ranged from 0.065 milligrams per kilogram (mg/kg) to 6.1 mg/kg (0 to 2 inches below ground surface [bgs]) and from 0.014 mg/kg to 1.2 mg/kg (16 inches to 18 inches bgs). As shown in Appendix A and Figure 3 of the Work Plan, five samples (RS01-01 through RS01-05), located along Hamilton Boulevard, had Total PCB concentrations greater than 1 mg/kg (FW, 2001).

#### 2.1.2 *Redacted*

Seventeen samples were collected on this property during the RI. Total PCB concentrations ranged from a nondetectable level to 3.4 mg/kg (0 to 18 inches bgs). As shown in Appendix A and Figure 4 of the Work Plan, five samples located at the northern portion of the property along Hamilton Boulevard, had Total PCB concentrations greater than 1 mg/kg and one sample located in the southern corner of the property had a Total PCB concentration greater than 1 mg/kg.

#### 2.1.3 *Redacted - Property 13*

Twenty samples were collected on this property during the RI, along with two duplicate samples. During the EPA Tier III sampling event, one sample (Location A1-002 with a Total PCB concentration of 2.9 mg/kg) was previously collected from northwest of the driveway in the ROW, as shown in Figure 5 of the Work Plan. Aroclor-1254 or Aroclor-1260 was detected in the soils from 15 locations. Total PCB concentrations ranged up to 1.2 mg/kg and 44 mg/kg, respectively, for the 0 to 2-inch bgs and the 16- to 18-inch bgs intervals (Table A-2, Appendix A of the Work Plan). Two samples, RS13-17 at 1.2 mg/kg and RS13-19 at 44 mg/kg, had Total PCB concentrations greater than 1 mg/kg, and as shown in Appendix A and Figure 5 of the Work Plan, both of these samples are located in the northeast portion (i.e., the rear) of the property, which is closest to the CDE site (FW, 2001).

#### 2.1.4 *Redacted - Property 18*

With the exception of Location RS18-05, located in the center of the rear portion of the property, all of the samples collected at this property contained detectable levels of Aroclor-1254 (Table A-3, Appendix A of Work Plan). In the shallow 0 to 2-inch bgs interval, Total PCB concentrations ranged from 0.077 mg/kg to 57 mg/kg. Total PCBs ranged up to 310 mg/kg in the 16- to 18-inch bgs samples. As shown in Appendix A and Figure 6 of the Work Plan, nine samples had Total PCB concentrations greater than the 1-mg/kg screening criterion value. These locations were present in the north, northwest, and west along the property boundaries, with the maximum concentration (310 mg/kg) located in the northern corner of the property. This property is located adjacent to the CDE site.

### 2.2 Site Contaminants

The primary objective of the proposed remedial action is to excavate PCB-contaminated soils from four properties at the CDE site. Confirmation soil sampling with analyses by fixed-base laboratory at four properties will be used to confirm PCB concentrations are below 1 ppm, the EPA soil cleanup objective, and to document the conditions in the excavations. Chemical measurement data collected during this effort shall also be used to determine that the source used for backfill is clean. Additionally, perimeter air monitoring will be performed to ensure compliance with action levels established in the record of decision (ROD) for interior dust. Sampling will be performed as summarized in Table 1 of this FSP (Table 2 of the QAPP).

## 3.0 PROJECT ORGANIZATION AND SCHEDULE

This section provides a brief description of the roles and responsibilities of personnel who will be involved with the management of the remedial action investigation at the CDE site and presents the anticipated schedule for project activities. A project organizational chart is presented in Appendix B of the Work Plan. The project schedule is summarized in Appendix F of the Work Plan.

### 3.1 Project Organization

The U.S. EPA Region 2 is the lead agency for implementing remedial activities at CDE. The USACE Kansas City District is the support and contracting agency for the CDE project with CAPE as their prime contractor. The following subsections briefly describe the responsibilities of the personnel assigned to this project. All onsite personnel are responsible for complying with the requirements of the Work Plan, Site Safety and Health Plan (SSHP), Quality Control Plan (QCP), and this SAP.

The CAPE Project Manager (PM) and Site Superintendent will be responsible for implementing the plans and ensuring that all work requirements are enforced.

### **3.1.1 USACE Project Engineer**

As mentioned above, the USACE Kansas City District is the contracting agency for the CDE remedial site, and as such has overall responsibility for project management and execution. Patrick Nejand is the USACE New York District Project Engineer and primary USACE representative on site during site activities.

### **3.1.2 Program Manager**

The Program Manager (PGM), Ed King, Professional Engineer (PE), will have the overall responsibility for all technical, contractual, safety, and administrative matters for CAPE under this contract. He will ensure that a high degree of client responsiveness is maintained and will be responsible for:

- ▲ Reviewing and approving plans
- ▲ Overseeing staff selection
- ▲ Monitoring contract and task funds and schedules
- ▲ Implementing QA/quality control (QC) processes.

Mr. King will delegate day-to-day TO management to the PM, and QC management to the Contractor quality Control System Manager (CQCSM).

### **3.1.3 Project Manager**

The CAPE PM, Michael Lamon, will be responsible for overall direction, implementation, and enforcement of project requirements. His responsibilities include:

- ▲ Ensuring the project is being performed in a manner consistent with the CAPE Corporate Health and Safety Program, the scope of work, and the Base Specification Requirements
- ▲ Ensuring that all required plans (SSHP, CQCP, SAP, EPP, and Work Plan) are prepared, submitted in a timely manner, and approved by the USACE
- ▲ Providing project personnel with information related to health and safety matters and other critical issues related to the project
- ▲ Monitoring compliance with the project requirements by CAPE and subcontractor personnel
- ▲ Ensuring adequate resources are provided to the health and safety staff so that they may carry out their duties
- ▲ Maintaining communication with the USACE authorized representative
- ▲ Developing cost control documentation and all notifications to the USACE.

The PM will also have the authority to take the following actions:

- ▲ Determine personnel assignments on this project
- ▲ Stop site activities if an imminently dangerous situation exists. The emergency situation will be immediately reviewed with the Site Superintendent, Site Safety and Health Officer (SSHO), Corporate Health and Safety Manager (CHSM), and the USACE authorized representative.

### **3.1.4 Site Superintendent**

The Site Superintendent, Jerry Hackworth, will direct daily implementation and enforcement of the TO requirements during site activities. The Site Superintendent is responsible for oversight and all site activities including the management of field personnel. The Site Superintendent is responsible for implementing actions to ensure compliance with all work plans. Other responsibilities include:

- ▲ Coordinating and providing the necessary labor, equipment, and materials for material handling activities as required by the plan
- ▲ Ensuring site activities are scheduled and executed with adequate personnel and equipment resources to perform the project safely
- ▲ Ensuring adequate communication between field personnel and emergency response personnel is available
- ▲ Ensuring site personnel are trained in accordance with Section 10.0 of the SSHP.

The Site Superintendent will have the authority to stop site activities if an imminently dangerous situation exists. The emergency situation will be immediately reviewed with the PM and the CHSM.

### **3.1.5 Contractor Quality Control Systems Manager**

CAPE's Contractor Quality Control Systems Manager (CQCSM), Chuck Reed, will be responsible for overall management of the Contractor Quality Control (CQC) System. He has the authority to act independently in all QC matters. He reports directly to the CAPE QC Officer. The CQCSM may have assistance from a QC Technician. The CQCSM's responsibilities are outlined below:

- ▲ Manage the performance of all onsite and offsite inspections and testing
- ▲ Evaluate the results of the inspections and testing
- ▲ Notify the CAPE PM of acceptance or rejection of the work
- ▲ Manage documentation of all inspections, testing, and notifications to site project management through Daily Quality Control Reports (DQCRs)

- ▲ Review all required submittals relating to QC, and forward all submittals to the USACE for review and approval.

The CQCSM will have the authority to suspend work for which quality standards are not being met or maintained. Should modifications or revisions to the work relating to QC be required, the CQCSM will prepare a request for modification or revision, and submit it to the USACE Authorized Representative. The CQCSM will ensure that approval of the modification or revision is received before allowing the modifications or revision to occur in the field.

### **3.1.6 Corporate Quality Assurance Director**

In accordance with the CAPE Quality Assurance Program, the Corporate QA Director, Chris Caviness, PE, JD, will supervise the QC activities of the CQCSM. In addition, the Corporate QA Director will serve as a technical resource to the CQCSM. All project QC records and activities are subject to review by the Corporate QA Director.

### **3.1.7 Corporate Health and Safety Manager**

The CHSM, Glen Mayekawa, is a Certified Industrial Hygienist (CIH) with experience in hazardous waste site operations. The CHSM will have the following responsibilities:

- ▲ Interface with the PM about project execution, health and safety-related, and QC issues
- ▲ Approve the SSHP and any amendments
- ▲ Approve revised or new SSH protocols for site activities
- ▲ Monitor compliance with the SSHP
- ▲ Ensure that all CAPE personnel and subcontractors designated to work on the TO are qualified according to CAPE medical surveillance and training and USACE requirements
- ▲ Determine and implement personnel disciplinary actions for safety violations
- ▲ Approve the appointment of the SSHO and any replacement SSHOs.

The CHSM will have the authority to take the following actions:

- ▲ Stop site activities if an imminently dangerous situation exists. The emergency situation will be immediately reviewed with the PM and Site Superintendent/SSHO
- ▲ Direct personnel to change a work practice if it is determined to be hazardous to the health and safety of site personnel
- ▲ Remove personnel from the project if their actions endanger their health and safety or the health and safety of co-workers.

### **3.1.8 Chemical Quality Control Manager**

Corporate Program Chemist, Christelle Newsome will serve as the technical resource to the QCSM in the area of chemical data QC. All chemistry project records and activities are subject to review by the Chemical Quality Control Manager (ChQCM). As CAPE's ChQCM, Ms. Newsome is responsible for ensuring that all chemistry-related project objectives are obtained. These objectives include responsibility for defining all DQOs, sampling and analysis, data documentation and validation, and data QA portions of final project reports. Procedures for corrective actions, deliverables and submittals, deviations and changes, chemical quality documentation, data validation, minimum data reporting requirements, and DQOs for chemical parameter measurement shall be implemented by the ChQCM. The ChQCM shall also review all project chemical data submittals and deliverables developed by the Environmental Sampler. The ChQCM shall be responsible for overseeing the development and submission of the FSP, QAPP, and the Chemical Data Final Report (CDFR) and is responsible for maintaining the official, approved QAPP. Ms. Newsome also functions as the Corporate Program Chemist, responsible for coordinating communication among the project team, the government laboratory(ies), and the subcontracted laboratories. The Program Chemist shall also be responsible for performing data verification and data review on the analytical data. The CQCSM shall coordinate activities with the ChQCM.

### **3.1.9 Project Chemist**

The Project Chemist, Christelle Newsome, shall ensure that any necessary revisions are made and shall check on the implementation of this QAPP during the life of the project. The Project Chemist shall ensure that all chemistry related goals of the program are obtained and shall be responsible for coordinating communication between the project team, the government laboratory(ies), and the subcontracted laboratories. The Project Chemist shall also be responsible for performing data verification and data review on the analytical data. The Project Chemist reports to CAPE's Program Chemist and the ChQCM.

### **3.1.10 Site Safety and Health Officer**

The Site Safety and Health Officer (SSHO), Ken Beatty, will serve as an advisor to the PM in matters regarding health and safety. The SSHO for this project will be primarily responsible for the technical and administrative functions relative to health and safety during site activities. The SSHO will have the following responsibilities:

- ▲ Ensure that all site activities are performed in a manner consistent with the SSHP and the CAPE Corporate Health and Safety Program
- ▲ Interface with the CHSM about onsite implementation of the SSHP
- ▲ Direct daily health and safety activities on site
- ▲ Report all incidents, accidents, and near-misses to the CAPE PM, CHSM, and the USACE authorized representative

- ▲ Maintain health and safety equipment on site
- ▲ Inspect ongoing activities and report any health and safety deficiencies to the CHSM
- ▲ Accompany or maintain communication with each work crew
- ▲ Perform site monitoring to assure that site personnel are adequately protected
- ▲ Conduct initial site-specific safety training and regular safety briefing for all site personnel
- ▲ Conduct a safety briefing for all site visitors before entering the site

The SSHO will have the authority to take the following actions:

- ▲ Stop site activities if an imminently dangerous situation exists. The emergency situation will be immediately reviewed with the PM, and CHSM
- ▲ Direct personnel to change a work practice if it is determined to be hazardous to the health and safety of site personnel
- ▲ Temporarily suspend an individual from field activities for an infraction of the SSHP, pending discussion with the CHSM
- ▲ The SSHO will report to the CHSM about health and safety-related issues.

#### **3.1.11 Work Crew Personnel**

The work crew will have the following responsibilities:

- ▲ Immediately report any unsafe or potentially hazardous conditions to the SSHO/Site Superintendent
- ▲ Report all incidents, accidents, and near misses, no matter how minor they may seem, immediately to the SSHO/Site Superintendent
- ▲ Maintain knowledge of the information, instructions, and emergency response procedures contained in the SSHP and the Work Plan
- ▲ Comply with requirements and procedures set forth in the SSHP and other project documents and with any amendments.

#### **3.1.12 Subcontractors**

The subcontractors listed below are expected to perform work under this project. All subcontractors used to perform this contract scope of work will report directly to the PM and on site to the Site Superintendent or designee. Subcontracted work will be conducted in accordance with the requirements of the contract and subcontractor scopes of work.

Land Surveyor: CAPE will use a professional land surveyor to locate historic sampling locations, demark the property boundaries and document the remedial actions performed at each property.

Analytical Laboratories: Confirmation soil samples, including QA/QC samples, will be analyzed by the EPA Region 2 Division of Environmental Science and Assessment (DESA) laboratory in Edison, New Jersey.

The analytical subcontract laboratory will be responsible for the analysis of samples for disposal profiling, of imported soils to be used as backfill, and from perimeter air monitoring, including QA/QC samples. A subcontract laboratory will be required for these services to meet the quick turnaround time requirements for these samples. In the case of the air samples, the analytical method is offered by specialty laboratories only. The laboratory must be USACE-validated, maintain current National Environmental Laboratory Accreditation Program (NELAP) certification, and maintain current required New Jersey licenses and accreditations. The laboratory, Kemron Laboratory of Marietta, Ohio, has been chosen as the analytical subcontract laboratory.

Air Analyses Laboratory: The analytical subcontract laboratory will be responsible for the analysis, QA/QC and reporting of air samples. The laboratory must be USACE-validated, maintain current NELAP certification, and maintain current required New Jersey licenses and accreditations. Princeton Laboratory has been chosen as the analytical subcontract laboratory.

Data Validation: The data validation subcontractor will be responsible for the review, validation, and qualification of analytical data generated during the field event.

### **3.2 Project Schedule**

The proposed project schedule is summarized in Appendix F of the Work Plan. The schedule shows the start date, duration, and date of completion for planned activities associated with this remedial action.

## **4.0 FIELD ACTIVITIES AND SAMPLING METHODS**

This section provides site-specific guidance for sample collection. Table 1 provides the anticipated number of samples to be collected as well as the analytical methods to be used. The sample quantities are estimated and are subject to change based on field conditions.

Before the collection of samples, all nondisposable sampling equipment will be decontaminated in accordance with Section 4.2 of this FSP and 3.5 of the Work Plan. The laboratory will provide sample containers that are certified clean and treated according to U.S. EPA specifications. Containers will be stored in clean areas to prevent exposure to fuels, solvents, and other contaminants.

Precleaned and certified disposable sampling equipment may be used directly from the sealed package without the need for additional decontamination. Preservation of samples will comply

with prescribed methodology according to the Contract Laboratory Program (CLP), SW-846, and National Institute for Occupational Safety and Health (NIOSH) standard protocols. After sample collection, the sample containers will be immediately sealed and labeled, placed on ice in a cooler, and shipped to the laboratory via overnight delivery to be received at a temperature not to exceed 6 degrees Celsius. Samples for VOC shipments shall contain trip blanks and all sample shipments shall be accompanied by a temperature blank to comply with U.S. EPA requirements.

#### 4.1 Sample Collection

The following subsections provide details of the field activities associated with the removal activities at OU-1, Phase A. This section provides general details of excavation procedures for each site and provides guidance for excavation and additional excavation (if required) to meet remedial goals. Table 1 describes in detail the sampling frequency, approximate samples, sampling method, analytical method being performed and the container size for each of the samples. All samples for the project, due to depth of the sampling, will be taken by disposable sample spoon/trowel, stainless steel spoon/trowel, and/or stainless steel hand auger.

The excavation will be completed with appropriately sized heavy equipment. At a minimum, an excavator will be used during the removal activities. CAPE will excavate soil to the appropriate depth at each site based on excavation limits determined by chemical measurement data that confirms PCB concentrations are below 1.0 ppm, the EPA soil cleanup objective. See design figures in the Work Plan for the four properties where soil excavations/removals will be performed. Please refer to the Work Plan for further information regarding the excavations.

During excavation, good engineering practices and appropriate measures will be implemented to control both contaminant releases and general exposure to workers. Workers engaged in waste removal or handling activities will be required to wear an appropriate level of personal protective equipment (PPE) as described in the SSHP and as determined on site by the SSHO.

To remediate the OU-1, Phase A, properties, ~~[redacted]~~ the left-in-place PCB contamination must be below 1.0 ppm. To determine and confirm the lateral and vertical extents of the PCB impact to each property, historical information was reviewed and a sampling process was developed. Field screening measurements to delineate excavation boundaries (5- x 5-foot grid increments at 1-foot -deep intervals) plus definitive samples splits for confirmation will be performed before excavation.

The field screening, using SDI Enys PCB Immuno-Assay Sampling Kits (hereafter referred to as PCB field test kits), will be conducted as follows once the survey has located the historic boring locations at each property:

- ▲ Enclose the historic boring locations with a 5- by 5-foot box painted on the ground surface

- ▲ Field screening samples will be collected from each side of the box and from the center (location of the historic boring). Due to the relatively small size of the excavation areas, CAPE's sample design will attempt to identify the historical sampling location to confirm the accuracy of previous sample location survey information. The four samples collected from each of the sides will be considered sidewall samples, while the center one will be considered the excavation bottom sample. The depths of these samples vary depending on the depth of the historic sample. The screening samples will be extended or "stepped out" using the same 5- by 5-foot interval until the limits of the excavation are refined laterally and vertically. CAPE intends to conduct the field screening at one location to completion before sending any samples to the analytical laboratory for confirmation.
- ▲ If the results of the field screening test indicate a nondetect (0.5 ppm or less), soil from that location will be sent to an analytical laboratory for confirmation
- ▲ If the results of the field screening test indicate a concentration greater than 1 ppm, the 5- by 5-foot grid will expand. The grid will expand at 5-foot intervals until a nondetectable level (0.5 ppm or less) is achieved. The excavation bottom sample will be biased toward the sample location with the highest concentration. This process will continue until all the concentrations are less than 1 ppm and they are confirmed by the analytical laboratory, reported at or below 0.49 ppm reporting limit for PCBs.

Postexcavation field screening samples of the excavation base consisting of five grab samples composited from a 900 square foot area and compositing five grab samples from each sidewall of a 900 square foot excavation will be taken. Confirmation sampling will occur on a 20 percent frequency to field screening samples to confirm left-in-place concentrations. These confirmation samples will be sent to and analyzed at a fixed-base laboratory with results reported at or below 0.49 ppm reporting limit for PCBs.

The following additional sampling will be performed and analyzed as summarized in Table 1:

- ▲ **Backfill Sampling:** General backfill and topsoil backfill brought in for offsite backfill sources will be analyzed as summarized in Table 1 and meet the requirements of New Jersey Department of Transportation (NJ DOT) 909.10 and American Society for Testing and Materials (ASTM) D 5268. Sampling will be performed to confirm that the backfill is clean and below regulatory requirements for contaminants. Sample data of clean backfill and topsoil will be compared to criteria indicated in NJDEP Soil Cleanup Criteria (N.J.A.C. 7:26 D). Sample data exceeding the NJDEP Residential Direct Contract Soil Cleanup Criteria shall be unacceptable as topsoil or backfill.
- ▲ **Air Sampling:** Samples from perimeter air monitoring, including QA/QC samples, will be sent for analyses to the DOD-approved laboratory

- ▲ **Disposal Profiling/Sampling:** Samples of material for disposal profiling will be analyzed as summarized in Table 1 to determine the disposal alternatives of the site's waste.

#### **4.1.1 Sample Collection Procedures and Equipment**

All sampling procedures will be logged in the field log book, including sampling techniques employed, sampling equipment used, decontamination procedures employed, and calibration of measuring and test equipment. Appropriate sampling procedures will be followed at all times to ensure that representative soil samples are provided for analysis, and that the act of sampling does not contribute to further contamination or cross-contamination at a site. In the event that it is determined these procedures are not adequate due to site-specific conditions, all deviations/activities will be documented in the field logbook.

Before samples are collected, a new pair of latex or nitrile gloves will be donned by anyone handling the samples. Clean, dedicated sampling equipment, such as new or decontaminated stainless steel bowls and spoons/trowels, or drum thief/dip jar will be used to collect the samples.

**4.1.1.1 Soil Sampling Procedures.** Soil samples to be analyzed using PCB field test kits will be collected as grab samples.

Excavation confirmation soil samples, will be collected as composite samples from the excavated material.

Dipsosal profile soil samples will be representative of the material for disposal.

For analyses other than volatile organic compounds (VOCs), the sample will be homogenized and transferred into appropriate containers and the lids will be secured tightly. Collection and homogenization will be performed in the following manner:

- ▲ Clean and decontaminate soil sampling equipment as described in Section 4.2 below of this FSP
- ▲ Put on a new, clean, chemical-resistant pair of disposable gloves
- ▲ Obtain appropriate sample containers, disposable sampling spoon/trowel, decontaminated stainless steel spoon/trowel and/or stainless steel hand auger
- ▲ Carefully remove the top layer of soil to the desired sample depth interval with a disposable or decontaminated spoon, trowel, or hand auger. Collect sufficient sample using the same stainless steel or disposable spoon or trowel at the sample location (or multiple locations if a composite sample)
- ▲ Place an adequate volume of sample for the chosen analytical parameter(s) into an appropriate sample bottle or stainless steel mixing bowl. The preferential order of sample collection is VOCs, headspace screening sample (which can also be used for geotechnical purposes), semivolatile organic compounds (SVOCs),

PCBs/pesticides, herbicides, metals, characteristics (such as reactivity, corrosivity, ignitability, etc.), and physical tests (such as paint filter test, grain size, etc.). If the sample is to be homogenized, the quartering method will be used, as described below. If large clumps of material (i.e., compacted clay), this material will be cut using a decontaminated stainless steel blade or spoon mixed thorough with other soil particles contained in the matrix. If gravel is present in the sample aliquot, the gravel will be removed before homogenization of the soil material. If the sample is composited from several subsamples, a subsample aliquot will immediately be collected from each subsample location for potential VOCs analysis if applicable. A headspace screening sample will also be collected at each subsample location. The VOC sample to be analyzed for the composited area will be selected from the subsample aliquots based on the relatively high subsample headspace screening results. The collection of SVOCs, PCBs/pesticides, herbicides, metals, characteristics, and or physical tests samples will be collected from the homogenized sample.

For analyses other than VOCs, it is important that soil samples be mixed as thoroughly as possible to ensure that the sample is representative. The most common method of mixing is referred to as quartering. The soil in the sample pan is divided into quarters and moved to the edges of the bowl. Each quarter is mixed, then all quarters are mixed into the center of the pan. This procedure is followed several times until the sample is adequately mixed. If round bowls are used for sample mixing, adequate mixing is achieved by stirring the material in a circular fashion and occasionally turning the material over. The sample containers should be filled completely; no head space should remain in the sample containers.

- ▲ Visually check to ensure that a Teflon liner is present in the cap (if required). Secure the cap tightly
- ▲ Immediately after the sample is collected, label the sample containers per Section 5.4 of this FSP
- ▲ If no map of the sampling locations is available before sampling, a simple drawing of the site (not necessarily to scale) will be included in the field log book to provide an illustration of all sampling points
- ▲ A chain-of-custody (COC) form will be completed to maintain an accurate record of sample collection, transport, analysis, and disposal. Refer to Section 5.5 for COC labeling procedures
- ▲ Decontaminate equipment after each sampling event as described in Section 4.2 of this FSP
- ▲ Discard contaminated personal protective clothing (e.g., gloves and Tyveks)
- ▲ All samples will be handled and packaged in accordance with the procedures specified in Section 6.0 of this FSP.

The remedial goals for each OU-1 Phase A property are stated in Section 1.2 of this FSP (i.e., EPA cleanup goal of 1 ppm PCBs). If the excavation soil samples meet the 1 ppm EPA cleanup objective for PCBs, the soil underneath the excavated soils may be considered uncontaminated and no further excavation in this area is required. If excavation soil samples exceed the 1 ppm EPA cleanup objective for PCBs, the soil below the excavated soils may be considered contaminated and further excavation and sampling will be required.

**4.1.1.2 Decontamination Wastewater Sampling Procedures.** Dipsosal profile wastewater samples will be representative of the material for disposal. Aqueous samples of the decontamination wastewater fluids will be collected as grab samples. The sample(s) will be transferred into appropriate containers and the lids will be secured tightly. Collection will be performed in the following manner:

- ▲ Clean and decontaminate sampling equipment as described in Section 4.2 below of this FSP
- ▲ Put on a new, clean, chemical-resistant pair of disposable gloves
- ▲ Obtain appropriate sample containers and decontaminated drum thief/dip jar
- ▲ Touch the nonsparking drum opening equipment to the bung or lid and allow an electrical conductive path to form. Carefully remove the retaining ring and drum lid with the use of nonsparking tools
- ▲ Slowly, carefully, and gently lower the drum thief/dip jar to the bottom of the drum submersing it completely and allow it to fill. Create a vacuum with the sampler's gloved thumb on the end of the drum thief and slowly remove the sampling device from the drum
- ▲ Release the sample from the device into an appropriate sample container. Repeat the procedure until sufficient sample volume is obtained for the chosen analytical parameter(s). The preferential order of sample collection is VOCs, SVOCs, PCBs/pesticides, herbicides, metals, and characteristics (such as reactivity, corrosivity, ignitability, etc.). The collection of SVOCs, PCBs/pesticides, herbicides, metals, and characteristics samples will follow collection of the VOCs sample. The sample containers should be filled completely; no head space should remain in the sample containers
- ▲ Visually check to ensure that a Teflon liner or septa is present in the cap (if required). Secure the cap tightly
- ▲ Immediately after the sample is collected, label the sample containers per Section 5.4 of this FSP
- ▲ Close the drum(s) when sampling is complete
- ▲ Write all pertinent sampling information in the field logbook

- ▲ A COC form will be completed to maintain an accurate record of sample collection, transport, analysis, and disposal. Refer to Section 5.5 for COC labeling procedures
- ▲ Decontaminate equipment after each sampling event as described in Section 4.2 of this FSP
- ▲ Discard contaminated personal protective clothing (e.g., gloves and Tyveks)
- ▲ All samples will be handled and packaged in accordance with the procedures specified in Section 6.0 of this FSP.

**4.1.1.3 Perimeter Air Sampling Procedures.** Perimeter air monitoring samples will be collected during excavation of contaminated soil at each of the four properties. The samples will be collected using sorbent tubes. Air samples will be analyzed by NIOSH 5503. Please refer to the Community Ambient Air Monitoring Plan of the SSHP for procedural requirements.

## **4.2 Decontamination Procedures**

Wherever possible, disposable equipment will be used to minimize the amount of decontamination that will be required. Decontamination of nondisposable sampling equipment that comes in contact with samples (such as spoons/trowels, hand auger, sleeve rings, split-spoon sampling device, etc.) will be performed to prevent the introduction of extraneous material into samples, and to prevent cross contamination between samples. All nondedicated equipment that may directly or indirectly contact samples will be decontaminated in a designated decontamination area. In addition, CAPE will prevent the decontaminated sampling equipment from coming into contact with potentially contaminated substances such as oil, engine exhaust, corroded surfaces, and dirt.

The following procedures will be used for decontamination of nondisposable sampling equipment and personal protective equipment (PPE):

1. Rinse with potable water. This step will decrease the gross contamination and reduce the frequency at which the nonphosphate detergent and water solution need to be changed. Change the water frequently.
2. If sampling equipment is used to collect samples that contain oil, grease, free product or other hard to remove materials, it may be necessary to rinse the equipment several times with pesticide-grade isopropanol to remove the materials before proceeding.
3. Scrub and wash with a solution of potable water and a nonphosphate detergent such as Liquinox™ or equivalent laboratory-grade detergent. This step will remove remaining contamination from the equipment. Dilute the nonphosphate detergent as directed by the manufacturer.

4. Rinse with potable water. This step will rinse the detergent solution away from the equipment. Change the water frequently.
5. Triple-rinse with deionized water. This step will rinse away any detergent solution and potable water residues. Rinsing will be done by applying the deionized water from a stainless steel Hudson-type sprayer or squeeze bottle made of Nalgene™ or Teflon™ (or equivalent) while holding equipment over a 5-gallon bucket.
6. Air dry the equipment on a clean surface or rack.
7. If the sampling device will not be used immediately after being decontaminated, it will be wrapped in oil-free aluminum foil.
8. All decontamination fluids/rinsate will be placed in drums or tanks (i.e., appropriate storage container) and staged for disposal.

#### **4.2.1 Decontamination Fluids**

If nondisposable sampling equipment is used, decontamination of sampling equipment will generate a limited amount of decontamination fluids. These decontamination fluids will consist of wastewater containing detergent and trace soils. Decontamination fluids will be collected, containerized, sampled, and analyzed, as stated in Table 1. Appropriate disposal will be determined, based on the results of the wastewater disposal profile/characterization analysis.

#### **4.3 Miscellaneous Wastes**

PPE used during field activities (including latex or nitrile gloves, Tyvek, paper towels, etc.) will be double-bagged and disposed of as solid waste.

#### **4.4 Storage, Transportation and Disposal of Samples**

Sample and shipment manifesting will be in accordance with 40 Code of Federal Regulations (CFR) 261, 40 CFR 262, 40 CFR 268, 49 CFR 172, and 49 CFR 178. Appropriate disposal of samples according to regulations will be handled by the laboratory as part of their services under their subcontract.

##### **4.4.1 Waste Storage Areas**

Please refer to Section 5.5 of the Work Plan. Soils that are stockpiled on site will be stored on top of a bermed polyethylene liner and covered with polyethylene to prevent contaminants from migrating off site or into clean soil below the pile and liner.

Rolloff boxes and/or containers of remediation wastes will be stored in a secured temporary accumulation area.

Project wastes, if there are any to store, will be stored in one of the following settings and according to the following requirements:

#### **4.4.1.1 Drums/Small Containers.**

- ▲ Drums and small containers of hazardous/nonhazardous waste will be transported to the temporary accumulation areas on wood pallets and will be secured together with nonmetallic bonding
- ▲ Drums will be inspected and inventoried upon arrival onsite for signs of contamination and/or deterioration
- ▲ Adequate aisle space (e.g., 30 inches) will be provided for containers such as 55-gallon drums to allow the unobstructed movement of personnel and equipment. A row of drums should be no more than two drums wide
- ▲ Drums may not be stacked more than two high
- ▲ Each drum will be provided with its own label
- ▲ Drums will remain covered except when removing or adding waste to the drum. Covers will be properly secured at the end of each workday
- ▲ Drums will be disposed of with the contents. If the contents are removed from the drums for offsite transportation and treatment or disposal, the drums will be decontaminated before reuse or before leaving the site.

**4.4.1.2 Portable Tanks.** Please see Sections 4.2 and 4.2.1 above. It is not anticipated that liquid hazardous waste will be accumulated during this project. The information in this subsection is provided in the event that liquid hazardous waste is accumulated.

- ▲ Only nonstationary tanks (such as cargo tank or other wheeled tank) will be used to accumulate hazardous waste
- ▲ Tanks will be provided with secondary containment
- ▲ Tanks will be inspected upon arrival on site for signs of deterioration and contamination. Any tank arriving on site with contents will be rejected
- ▲ Tanks will be provided with covers
- ▲ Each tank will be labeled.

**4.4.1.3 Stockpiles.** Please refer to Section 5.5 of the Work Plan. The following procedures will be followed when stockpiling soils:

- ▲ Stockpiles will be located near the excavation areas and within an area of existing contamination
- ▲ Stockpiles will be provided with a liner, cover, and perimeter berm to prevent release or infiltration of liquids

- The perimeter berm, typically hay bales placed beneath the liner, will be constructed to allow for collection of any free liquids draining from the stockpile
  - Accumulated free liquids will be pumped (or otherwise removed) to a container
  - Covers will be provided as necessary to prevent wind dispersion or run-on/run-off from precipitation events
  - Minimum 6-mil polyethylene sheeting will be used for liners and covers
  - The liner must be placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure
- ▲ Covers and perimeter berms will be secured in place when not in use and at the end of each workday
  - ▲ Construction materials for the stockpiles that contact waste will be disposed of as contaminated debris
  - ▲ A record will be maintained in the field logbook documenting accumulation dates will be maintained for soils and other waste stored on site in stockpiles.

#### **4.4.1.4 Rolloff Boxes/Tandem Axle Dump Truck.**

- ▲ Rolloff boxes/tandem axle dump trucks will be inspected upon arrival on site. Any rolloff containers/tandem axle dump trucks arriving with contents will be rejected
- ▲ Rolloff boxes/tandem axle dump trucks for hazardous or PCB-contaminated soils will be provided with covers and disposable liners. Liners will be disposed of as contaminated debris
- ▲ When not in use, securely fastened covers will be installed on all rolloff boxes
- ▲ Old labels will be removed
- ▲ Rolloff boxes/tandem axle dump trucks will be inspected by the transporter after removal of the liner and decontaminated in the event of evidence of liner failure.

### **4.5 Spill Cleanup Verification**

In the event of a spill or release of a hazardous substance, pollutant, contaminant, or oil, CAPE will notify the USACE immediately. The USACE will, in turn, notify the regulatory agencies. Immediate containment actions will be taken to minimize the effect of any spill or leak. Cleanup will be in accordance with applicable federal, state, and local regulations. As directed by the USACE, additional sampling and testing will be performed to verify that spills have been cleaned up.

### **4.6 Investigation-Derived Waste**

All wastes generated that are not site treated and discharged will be shipped under proper manifest or bill of lading by a licensed transporter. If any materials are determined to be

hazardous, CAPE will request an EPA identification number. Hazardous material will be transported off site in accordance with the requirements of 49 CFR Sections 171, 172, 173, 178, and 179. Hazardous materials will be stored on site no longer than 90 days in accordance with 40 CFR 262 to avoid classification as a RCRA storage unit.

Hazardous materials will be marked with a hazardous waste label identifying the material description, hazard class, generator, generator's address, and accumulation start date. Manifests will be signed by a USACE representative; under no circumstances will a CAPE representative sign a manifest. Manifests will include the following information, at a minimum:

- ▲ Transporter information, including name, address, contact, and phone number
- ▲ Generator information, including name, address, contact, and phone number
- ▲ Site name and address
- ▲ Description of waste
- ▲ Type of container
- ▲ Quantity of waste.

The selected disposal facility will be licensed to receive and dispose of hazardous waste and will generate certification of disposal upon final disposal. The disposal facility will be selected before the start of project activities and this information will be conveyed to the U.S. EPA RPM. The following facilities are likely candidates for receipt of wastes generated from CAPE's activities during the Phase A RA work:

For PCB soil concentrations greater than 50 ppm:

- ▲ CWM Chemical Services, LLC, 1550 Balmer Road, Model City, NY, 14107 or
- ▲ Environmental Quality Company, Wayne Disposal, Inc, 49350 N. I-94 Service Dr., Belleville, MI 48111.

For PCB soil concentrations less than 50 ppm:

- ▲ CWM Chemical Services, LLC, 1550 Balmer Road, Model City, NY, 14107 or
- ▲ Casie Protank, 3209 North Mill Road, Vineland, New Jersey, 08360.

After obtaining all necessary approvals to transport and dispose of the waste, CAPE will oversee the removal of the rollofts from the site and ensure proper manifesting at the departure point. Trucks leaving the site will be cleaned of gross materials to avoid transfer to roadways. Haul routes will be monitored and cleaned of project-associated debris throughout the project duration.

Disposal facility acceptance documentation and return copies of all manifests will be kept on file by CAPE. If a returned manifest is not received within 35 days of shipment date, the disposal facility will be contacted and follow-up notifications made if not received within 45 days.

## **5.0 SAMPLE DOCUMENTATION AND FIELD DOCUMENTATION**

Procedures to ensure the custody and integrity of the samples begin at the time of sampling and continue through transport, sample receipt, preparation, analysis and storage, data generation and reporting, and sample disposal. Records concerning the custody and condition of the samples are maintained in field and laboratory record books.

### **5.1 Field Logbook**

Field logs summarizing daily activities and the field logbook will be used to record sampling activities each day. Entries in the field logs will include the following information:

- ▲ Name of author, date, and times of arrival and departure from the work site
- ▲ Location of sampling activity
- ▲ Purpose of sampling activity
- ▲ Names and affiliations of personnel on site
- ▲ Sample collection or measurement methods
- ▲ Quantity, location, and volume of sample(s) collected
- ▲ Details of the sampling location, including a sketch map illustrating the sample location
- ▲ Date and time of the sample collection and name of collector
- ▲ Sample identification numbers
- ▲ Information regarding sampling changes and/or decisions
- ▲ Documentation for investigation-derived waste (IDW) including types of containers, contents, and approximate volume
- ▲ Field observations and comments.

Sufficient information will be recorded in the field logbook to reconstruct the sampling event, if necessary.

### **5.2 Sample Numbering System**

A unique sample numbering scheme will be used to identify each sample designated for laboratory analysis. The purpose of this numbering scheme is to provide a tracking system for the retrieval of analytical and field data on each sample. Identifiers will be assigned to all environmental and QC samples and will appear on the sample labels, COC forms, field sampling forms, and field logbooks.

The first element will be an alphanumeric location designator identifying the type of location being sampled. The second element will be the medium sample designator. For example, soil samples will be designated as SO. The third element will be the sequential sample designator. Wall and floor samples will be designated as "WL##" and "FL##" where ## is the next sequential number as designated by the sample coordinator. The fourth element will be the sample depth "YY," where YY is presented in feet such as "-01" represents a sample collected at 1 foot bgs. The following table summarizes the location and sample designators and QA/QC type codes.

LOCATION DESIGNATORS	MEDIA DESIGNATORS	SAMPLE DESIGNATORS
Property 13	SO – Soil	WL – Wall Sample
	WS – Water	FL – Floor Sample
Property 18	AM – Air Monitoring	DS – Disposal Profiling Sample
Property 1		BF – Backfill Sample
GFBF – General Fill Backfill Source		PA – Perimeter Air Sample
TSBF – Topsoil Backfill Source		PS – Personal Air Sample
CDAD – Cornell Dubilier Phase A Disposal		EB – Equipment Blank
		FB – Field Blank

Addresses redacted

An example sample identifier follows:

- ▲ 109A-SO-WL01-02 (Soil Sample #1 collected from a wall of the 109 Arlington Ave property at 2 feet bgs)
- ▲ 321S-SO-WL03-02 (could either be Sample #3 collected from a wall of the 109 Arlington Ave property at 2 feet bgs or the field duplicate of Primary Sample #1 collected from a wall of the 109 Arlington Ave. property).

The identity of a duplicate sample will be recorded in the field logbook and the sample collection forms, but not on the sample container label or COC forms. Duplicate samples will be labeled as primary samples, and the sample designator will follow the same sequential numbering protocol as for all other samples. This will allow the duplicate to be "blind" to the laboratory. Additionally, duplicate sample numbers will not be sequential; that is, the duplicate sample sequence number will not be the next number that would normally be assigned to the next field sample. For example, if a field duplicate sample is collected at a location and the original sample is given the identification "109A-SO-WL01-02," the duplicate sample will not be given the identification "321S-SO-WL02-02."

The following exceptions will be made to the sample numbering scheme:

- ▲ Matrix spike/matrix spike duplicate (MS/MSD) samples will be identified on the COC form by attaching "MS" or "MSD" to the sample number corresponding to the location where the MS/MSD was collected. For example, if identification "109A-SO-WL01-02" is chosen for the MS/MSD analyses, the MS will be identified as "109A-SO-WL01-02MS" and the MSD will be identified as "109A-SO-WL01-02MSD."

### 5.3 **Required Use of EPA FORMS II Lite™**

This project requires the use of EPA's Field Operations and Records Management System II Lite™ (FORMS II Lite™). EPA developed FORMS II Lite™ to assist samplers with generating their sample documentation and to track samples. FORMS II Lite™ requires the use of laptop computers and/or handheld computing devices in the field by field personnel.

FORMS II Lite™ is a flexible and easy-to-use, stand-alone, Windows-based application software that simplifies and accelerates the sample documentation process, reducing the generation of hand written documents by almost 70 percent. Specifically, FORMS II Lite™:

- ▲ Generates sample labels, bottle tags, and COC forms
- ▲ Tracks samples from the field to the laboratory
- ▲ Facilitates electronic capture of sample information into databases
- ▲ Exports data electronically as .xml, .dbf or .txt files.

#### 5.3.1 **FORMS II Lite™ Help References for Field Personnel**

Assistance with the FORMS II Lite™ system and help desk information are as follows:

FORMS II Lite™ Help Desk:

Hours: 9 a.m. - 5 p.m. ET, M-F

Telephone: (703) 818-4200

FORMS II Lite™ Web Site:

The FORMS II Lite™ Web site <http://dyncsdao1.fedcsc.com/itg/forms2lite/> is the primary source for information, documentation, and support for managers, developers, and FORMS II Lite™ users.

### 5.4 **Sample Labels**

Sample labels are necessary to prevent misidentification of samples. Each sample container will have a sample label attached. When necessary, the label will be protected from water and solvents with clear tape. Each label will contain the following information:

- ▲ Site name (Cornell-Dubilier Phase A)
- ▲ Names of sample collector

- ▲ Identification number of sample
- ▲ Date and time of collection
- ▲ Place of collection
- ▲ Analysis required
- ▲ Preservative.

## 5.5 Chain-of-Custody Records

CAPE will maintain COC records for all field primary and QC samples. The COC form serves as a legal record of possession of the sample and should be filled out in indelible ink. A sample is defined as being under a person's custody if any of the following conditions exist:

- ▲ It is in their possession
- ▲ It is in their view, after being in their possession
- ▲ It was in their possession and then was placed into a locked area
- ▲ It is in a designated secure area (an area controlled and restricted to authorized individuals or those accompanied by authorized individuals).

A COC record will be completed for every cooler containing fixed or onsite laboratory samples. The COC record will accompany every shipment of samples to the laboratory to establish the documentation necessary to trace sample possession from the time of collection. The record will contain the following information:

- ▲ Sample or station identification number
- ▲ Signature of collector, sampler, or recorder
- ▲ Date and time of collection
- ▲ Place of collection
- ▲ Sample matrix (soil, groundwater, etc.)
- ▲ Type of preservative
- ▲ Number of containers making up the sample
- ▲ Analysis requested for sample
- ▲ COC serial number
- ▲ Additional notes pertaining to suspected high contaminant concentrations
- ▲ Bill of lading or transporter tracking number (if applicable)
- ▲ Signatures of persons involved in COC
- ▲ Inclusive times/dates of possession.

COC records will accompany the samples from the site to the laboratory. The COC will be returned to CAPE with the final analytical report. All personnel with sample custody responsibilities will be required to sign, date, and note the time on the COC form when relinquishing samples from their immediate custody (except in the case where samples are placed into designated secure areas for temporary storage before shipment). Shipping air bills will be properly completed and will serve as custody documentation during times when the samples are being shipped from the site to the laboratory, and they will be retained as part of the permanent sample custody documentation.

In addition to the COC, signed custody seals will be placed on each cooler used for sample transport. These seals will consist of an adhesive material placed across the lid and body of the coolers in such a manner that if the cooler is opened, the seals will be broken. The custody seals will be signed and dated by the individual responsible for completing the COC form contained within the cooler.

## **5.6 Receipt for Sample Forms**

The laboratory portion of the form will be completed by the designated laboratory personnel and will contain the following information:

- ▲ Name of person receiving the sample
- ▲ Laboratory sample number (i.e., Sample Delivery Group number)
- ▲ Date and time of sample receipt
- ▲ Analyses requested
- ▲ Sample condition and temperature.

## **5.7 Documentation Procedures**

Original entries recorded in field logbooks, COC records, and other forms will be written in indelible ink. None of these documents will be altered, destroyed, or discarded, even if they are illegible or contain inaccuracies that require a replacement document.

## **5.8 Corrections to Documentation**

If an error is made on a document assigned to one individual, that individual will make corrections by drawing a line through the error, entering the correct information, and initialing and dating the change. The erroneous information will not be obliterated. Any subsequent error(s) discovered on a document will be corrected by the person who made the entry or his designee. All corrections must be initialed and dated.

## **5.9 Field Analytical Procedures**

### **5.9.1 Field Instrument Calibration**

Field use of the photoionization detector (PID) will generate measurements that are directly read from the meter. The PID will be calibrated as described in and in accordance with the manufacturer's manual. Calibration will be performed according to the manufacturer's recommendations and will be recorded in a field logbook and an equipment logbook. The PID instrument requires calibration at least daily, and before use after a long shutdown period (e.g., lunch breaks, equipment breakdowns, weather-caused breaks, etc.) using commercially available gases of known concentrations as the reference standard. Additionally, the PID field instrument will be checked at the end of the day to determine if any instrument drift has occurred. If drift has occurred, appropriate notes will be added to the field logbook, equipment logbook, and other sampling forms used that day. The data will be recorded in the field logbooks immediately after measurements are taken. If recording errors are made, the error will be

crossed out using a single line, initialed, and dated by the field member, and the correct information will be written in the space adjacent to the original (erroneous) entry.

All calibration procedures performed will be documented in the field logbook and will include the date/time of calibration, name of person performing the calibration, reference standard used, temperature at which readings were taken, and the readings. Multiple readings on one sample or standard, as well as readings on replicate samples, will likewise be documented.

Daily, and in some cases, more frequently, calibration of equipment will provide QC checks on all equipment used during the performance of project activities. Each instrument will have an individual identification number affixed. This number will be transcribed on field data records when using a particular instrument for a sampling event. All calibration, repair, and service records will be kept in individual equipment logbooks maintained for each instrument. Equipment that consistently falls out of calibration or exceeds manufacturer's critical limits will be repaired or replaced.

#### **5.9.2 Field Instrument Preventive Maintenance**

All equipment used by CAPE will be maintained in accordance with the manufacturer's instructions. Routine maintenance and all equipment repairs will be documented in the site logbook. Whenever a piece of equipment fails to operate properly, the instrument either will be repaired in-house (if possible) or will be sent out for repairs and another instrument equivalent to the original substituted. Preventive maintenance will be scheduled to minimize downtime and the potential interruption of analytical work.

Routine maintenance of PID instruments consists of battery charging to ensure that the instrument is ready to use when required and an occasional lamp or fan cleaning.

### **6.0 SAMPLE PACKAGING AND SHIPPING**

Coolers will be of metal or rigid plastic construction, with sufficient structural strength to withstand repeated dropping from a 4-foot height without cracking. Coolers will be constructed to provide insulation during shipment such that sample preservation with ice will be sufficient to maintain the contents within the range of temperatures required by the QAPP for sample preservation (4 degrees Celsius +/- 2 degrees). The inner liner of the cooler will be of a material (such as plastic) resistant to damage by sample contents (including acidic or basic sample preservatives), and which will not result in sample contamination (e.g., due to outgassing of organic vapors from the plastic).

Immediately after samples are collected and labeled for field analysis or offsite laboratory analysis, they will be placed in a cooler. Each sample for offsite laboratory analysis will be sealed in a plastic bag. The samples will be packed with shock-absorbent materials, such as bubble wrap, to prevent movement of sample containers during transport.

A plastic garbage bag will be placed in the sample cooler. Ice will be double-bagged in plastic zipperlock-type bags and placed in the bottom of the cooler. The plastic bags containing the samples will be placed in the cooler. Ice double-bagged in plastic zipperlock-type bags will also

be placed on top of the samples. The garbage bag will be filled to the top with packing material, and then sealed with tape. The field-completed COC form will be placed in a zipperlock-type plastic bag, which will be sealed and taped to the inside of the sample cooler lid.

The cooler will be sealed with at least three bands of packaging tape wrapped completely around the cooler, and custody seals will be affixed over the lid and body of the cooler to prevent or indicate tampering. If the cooler has a drain plug, the drain plug will be taped shut. The cooler will be labeled "Fragile" and "This End Up."

Confirmation samples, including QA/QC samples, will be analyzed by the EPA Region 2 DESA laboratory below.

#### U.S. EPA Facilities

EPA Region 2 Division of Environmental Science and Assessment (laboratory)  
Raritan Depot  
2890 Woodbridge Avenue  
Edison, NJ 08837-3679

Samples collected at the site for disposal profiling, and of imported soils to be used as backfill, will be shipped via an overnight service to the laboratory. Laboratory contact information follows.

Kemron Laboratory  
109 Starlite Park  
Marietta, OH 45750  
POC: Stephanie Mossburg, PM  
(740) 373-4071  
(740) 373-4226

Samples from perimeter air monitoring, including QA/QC samples, will be sent for analyses to the Department of Defense (DOD)-approved laboratory.

Princeton Laboratory  
Attention: Jane Dennison, Ph.D., CIH  
47 Maple Avenue,  
Flemington, NJ 08822  
POC: Jane Dennison, Ph.D., CIH  
(908) 806-2620  
Fax (908) 806-2409

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## TABLES

**PROJECT FIELD SAMPLE SUMMARY**  
(and Laboratory Sampling and Analytical Summary)

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx Sample No	Sampling Method	Sampling Equipment	TAT/ (prelim/final)	Data Pkg Req'd	Required Analysis	Analytical Method	Analytical Tier	Holding Time	Sample Pres.	Containers
<b>OU-1 Confirmation Soil Sampling</b>														
Soil Sampling	Addressed Veda chd Prop. 13	Soil	1 per 20 field samples (MS/MSD) 1/per 10 samples collected (Field Duplicates)	57 = 49 field samples + 5 field dups + 3 MS/MSD	Grab	Disposable sample trowel or Stainless steel trowel/spoon	72-hr/14-days	CAPE Level C	TCL PCBs	CLP OLM04.3	Tier II CLP Lab	14 days	Cool to 4°C	(1) 8 oz clear widemouth glass jar
		Soil	1 per						TCL PCBs	CLP OLM04.3	Tier II CLP Lab	7 days ext; 40 days analysis	Cool to 4°C	(1) 8 oz clear widemouth glass jar
		Soil							TCL PCBs	CLP OLM04.3	Tier II CLP Lab	7 days ext; 40 days analysis	Cool to 4°C	(1) 8 oz clear widemouth glass jar
		Soil							TCL PCBs	CLP OLM04.3	Tier II CLP Lab	7 days ext; 40 days analysis	Cool to 4°C	(1) 8 oz clear widemouth glass jar
	Pre-cleaned Equipment Rinsate Blank	DI Water	10% of confirmation soil samples		Prepared in the Field	N/A	72-hr/14-days	CAPE Level C	TCL PCBs	CLP OLM04.3	Tier II CLP Lab	14 days	Cool to 4°C <sup>2</sup>	(2) 1 L Amber glass
	Post-cleaned Equipment Rinsate Blank	DI Water	10% of confirmation soil samples		Prepared in the Field	N/A	72-hr/14-days	CAPE Level C	TCL PCBs	CLP OLM04.3	Tier II CLP Lab	14 days	Cool to 4°C <sup>2</sup>	(2) 1 L Amber glass
	Field Blank	DI Water	2 per water source (one at beginning of project and one at end)	2	Prepared in the Field	N/A	72-hr/14-days	CAPE Level C	TCL PCBs	CLP OLM04.3	Tier II CLP Lab	14 days	Cool to 4°C <sup>2</sup>	(2) 1 L Amber glass
(Taken only if equipment cleaned in the field)														

**OU-1 Disposal Sampling**

Disposal of Soil Waste	Excavated Soil	Soil	(1 sample per 150 cubic yards)	4	Grab	Disposable sample trowel or Stainless steel trowel/spoon	72-hr/14-days	CAPE Level B	TCLP Volatiles	8260B	Tier IV Subcontract Lab	14 days	Cool to 4°C	(1) 4 oz clear widemouth
									TCLP Semi-volatiles	8270C	Tier IV Subcontract Lab	7 days ext; 40 days analysis		(1) 8 oz clear widemouth glass jar
									TCLP Pesticides	8081A	Tier IV Subcontract Lab	7 days ext; 40 days analysis		(1) 8 oz clear widemouth glass jar
									PCBs	8082	Tier IV Subcontract Lab	7 days ext; 40 days analysis		(1) 8 oz clear widemouth glass jar
									TCLP Metals	6010B/7470A	Tier IV Subcontract Lab	6 months		(1) 8 oz clear widemouth glass jar
									Paint Filter Test	9095A	Tier IV Subcontract Lab			(1) 8 oz clear widemouth
									Reactivity	Chap. 7.3	Tier IV Subcontract Lab	ASAP		(1) 4 oz amber widemouth
									Corrosivity	9045	Tier IV Subcontract Lab	ASAP		(1) 4 oz amber widemouth
									Ignitability	1010	Tier IV Subcontract Lab	ASAP		(1) 4 oz amber widemouth
Disposal of Aqueous Waste Sampling, and Decon Activities	Purge Water and Decon Fluids	Water	Once	1 (or as needed for disposal)	Grab	Drum thief or dip jar	72-hr/14-days	CAPE Level B	TCL Volatiles	8260B	Tier II CLP Lab	14 days	HCl pH< 2; Cool to 4°C	(3) 40 ml vial
									TCL Semi-volatiles	8270C	Tier II CLP Lab	7 days ext; 40 days analysis	Cool to 4°C	(8) 1 L amber glass

**Table 1**  
**PROJECT FIELD SAMPLE SUMMARY**  
(and Laboratory Sampling and Analytical Summary)

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx Sample No	Sampling Method	Sampling Equipment	TAT/ (prelim/final)	Data Pkg Req'd	Required Analysis	Analytical Method	Analytical Tier	Holding Time	Sample Pres.	Containers									
									TCL Pesticides	8081A	Tier II CLP Lab	7 days ext; 40 days analysis											
									PCBs	8082	Tier II CLP Lab	7 days ext; 40 days analysis											
									TAL Metals	6010B/7470 A	Tier II CLP Lab	6 months											
																		Reactivity	Chap. 7.3	Tier IV Subcontract Lab	ASAP	HNO3 pH< 2; Cool to 4°C	(1) 500ml HDPE
																	Corrosivity	9045	Tier IV Subcontract Lab	ASAP			
																	Ignitability	1010	Tier IV Subcontract Lab	ASAP			
OU-1 Backfill Sampling																							
Backfill Sampling of General Fill	Backfill Soil Source	Soil	1 sample per 250 cubic yards	~2	Grab	Disposable sample trowel or Stainless steel trowel/spoon	72-hr/14-days	CAPE Level B	TCL Volatiles	8260B	Tier II CLP Lab	14 days	Cool to 4°C	(1) 4 oz clear widemouth									
									TCL Semi-volatiles	8270C	Tier II CLP Lab	7 days ext; 40 days analysis			(1) 8 oz clear widemouth glass jar								
									TCL Pesticides	8081A	Tier II CLP Lab	7 days ext; 40 days analysis											
									PCBs	8082	Tier II CLP Lab	7 days ext; 40 days analysis											
									Herbicides	8151A	Tier IV Subcontract Lab	7 days ext; 40 days analysis											
									TAL Metals	6010B/7470 A	Tier II CLP Lab	6 months											
									Grain Size		Tier IV Subcontract Lab	ASAP											
									Standard Proctor		Tier IV Subcontract Lab	ASAP											
									Radium-226	DOE EML HASL 300 4.5.2.3	Tier IV Subcontract Lab	6 months	None	(1) Marinelli Beaker 200 g minimum									
Backfill Sampling of Topsoil	Backfill Soil Source	Soil	1 sample per 250 cubic yards	~1	Grab	Disposable sample trowel or Stainless steel trowel/spoon	72-hr/14-days	CAPE Level B	TCL Volatiles	8260B	Tier II CLP Lab	14 days	Cool to 4°C	(1) 4 oz clear widemouth									
									TCL Semi-volatiles	8270C	Tier II CLP Lab	7 days ext; 40 days analysis			(1) 8 oz clear widemouth glass jar								
									TCL Pesticides	8081A	Tier II CLP Lab	7 days ext; 40 days analysis											
									PCBs	8082	Tier II CLP Lab	7 days ext; 40 days analysis											
									Herbicides	8151A	Tier IV Subcontract Lab	7 days ext; 40 days analysis											
									TAL Metals	6010B/7470 A	Tier II CLP Lab	6 months											
									Grain Size		Tier IV Subcontract Lab	ASAP											
									Standard Proctor		Tier IV Subcontract Lab	ASAP											

**PROJECT FIELD SAMPLE SUMMARY**  
(and Laboratory Sampling and Analytical Summary)

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx Sample No	Sampling Method	Sampling Equipment	TAT/ (prelim/final)	Data Pkg Req'd	Required Analysis	Analytical Method	Analytical Tier	Holding Time	Sample Pres.	Containers
PCB Air Sampling	Perimeter Air Monitoring	Air	[12 days x (4 perimeter locations + 2 personal locations + 1 blank)]	84	Grab	Sorbent Tubes	7 days	CAPE Level C	PCBs	NIOSH 5503	Tier IV Subcontract Lab	14 days	Cool to 4°C	

**Notes:**

1. CLP OLM04.3 = U.S. EPA Contract Laboratory Program Multi-Media, Multi-Concentration Organics Analysis.
2. If residual chlorine is present, add 1 mL 10% sodium thiosulfate (Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>) solution per liter water.
3. Preliminary results are provided according to CAPE Level A Deliverable Requirements.

ml = milliliter

HDPE = high density polyethylene

TBD = to be determined

TAT = Turn Around Time

TAL = target analyte list

TCL = target compound list

PCBs = polychlorinated biphenyls

TDS = total dissolved solids

DQO = data quality objective

°C = degrees Celsius

ASAP = as soon as possible

N/A = not applicable

ATTACHMENT 1

SAMPLE: CHAIN-OF-CUSTODY FORM  
SAMPLE LABEL  
CUSTODY SEAL



# CHAIN-OF-CUSTODY RECORD

2302 Parklake Drive, Suite 200, Atlanta, GA 30345-2907  
Tel No: (770) 908 7200 Fax No: (770) 908-7219

COC NUMBER

PROJECT NAME:	PROJECT NUMBER:	LAB NAME AND CONTACT:	FAX AND MAIL REPORTS/EDD TO: RECIPIENT 1 (Name and Company)	RECIPIENT 1 (Address, Tel No. and Fax No.):
PROJECT PHASE/SITE/TASK:	CTO OR TO NUMBER:	LAB PO NUMBER:	FAX AND MAIL REPORTS/EDD TO: RECIPIENT 2 (Name and Company)	RECIPIENT 2 (Address, Tel No. and Fax No.):
PROJECT CONTACT:	PROJECT TEL NO AND FAX NO:	LAB TEL NO AND FAX NO:	FAX AND MAIL REPORTS/EDD TO: RECIPIENT 3 (Name and Company)	RECIPIENT 3 (Address, Tel No. and Fax No.):

ITEM	SAMPLE IDENTIFIER	SAMPLE DESCRIPTION/LOCATION	MATRIX (see codes on SOP)	DATE COLLECTED	TIME COLLECTED	DATA PKG LEVEL (see codes on SOP)	TAT (calendar days)	ANALYSES REQUIRED (Include Method Numbers)												SAMPLE TYPE (see codes on SOP)	COMMENTS/ SCREENING READINGS	LAB ID (for lab's use)
1																						
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						

SAMPLER(S) AND COMPANY: (please print)	COURIER AND SHIPPING NUMBER:	SAMPLES TEMPERATURE AND CONDITION UPON RECEIPT (for lab's use):
--	------------------------------	---

RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME
Printed Name and Signature:			Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature:		
Printed Name and Signature:			Printed Name and Signature:		

- 1) COC Number: Assign a unique ID that is linked to the project; e.g., T107001-001
- 2) Project Name: Overall name of project (Kelly AFB)
- 3) Project Phase, Site, or Task: Name of specific site/task (Task 07 excavation)
- 4) Project Contact: CAPE contact person at site
- 5) Project Number: Project number assigned including charge code
- 6) CTO or TO Number: CTO or DO number assigned (TO 21)
- 7) Project Tel No. and Fax No.: Numbers where laboratory can call with questions or fax preliminary results
- 8) Laboratory Name and Contact: Name of lab where samples are to be sent and contact person (will be provided in the Sampling Analyses Plan)
- 9) Lab PO Number: Laboratory Purchase Order number for the particular sampling event
- 10) Lab Tel No and Fax No: Numbers to call lab with questions and to fax copy of COC
- 11) Fax and Mail Reports to; Recipient 1 (Name and Company): Person and company where prelim copy of analytical results are to be sent (Project Chemist)
- 12) Fax and Mail Reports to; Recipient 2 (Name and Company): Person and company where p final copy of analytical results are to be sent if to more than one (Chemistry Project Coordinator (CPC))
- 13) Fax and Mail Reports to; Recipient 3 (Name and Company): Person and company where final copy of analytical results are to be sent if to more than one (3<sup>rd</sup> Party Validator) Will be listed in Sample Analyses Plan )F
- 14) Recipient 1 (Address, Tel No., and Fax No.): Address, phone number and fax number of where prelim is to be faxed and final analytical results are to be sent
- 15) Recipient 2 (Address, Tel No., and Fax No.): Address, phone number and fax number of where prelim is to be faxed and final analytical results are to be sent if more than one
- 16) Recipient 3 (Address, Tel No., and Fax No.): Address, phone number and fax number of where prelim is to be faxed and final analytical results are to be sent if more than one
- 17) Item (numbered 1 through 10): to be used when relinquishing samples
- 18) Sample Identifier: Specific sample number for each sample NOT FOR EACH BOTTLE. For QC samples such as trip blanks, use TB-sample date-number (1,2,3...if more than one trip blank on that sample date).
- 19) Sample Description/Location- Describe sample and where it was collected (confirmation soil collected at NW wall of excavation A **or** groundwater sample collected at MW3 at OWS 13 **or** soil boring collected at 2' interval at OWS 13)
- 20) Matrix: Soil, Sediment, Water, Oil, Product, Vapor, Wipe, etc.
- 21) Date Collected: What day was sample collected
- 22) Time Collected: What time was sample collected (24-hour clock)
- 23) Data Package Level: CAPE Data Package Level (A, B, or C)
- 24) TAT (Calendar Days): Place turn-around-time in days for when preliminary results are due
- 25) Analyses Required (Include Method Numbers): List one analysis per column and include method number (will be listed in Sampling and Analysis Plan) (TCL VOCs by 8260B)
- 26) Sample Type: Field, QC, Grab, Composite (include all applicable descriptions; e.g. Field Grab
- 27) Comments/Screening Readings: Place any comments here, for example, "strong organic odor". Also if soil was screened before sent to lab, place screening results here.
- 28) Lab ID: Leave this blank, this is for lab's use.
- 29) Sampler(s) and Company: ALL samplers' names and companies here.
- 30) Courier and Shipping Number: Put name of shipping company and airbill number(s) here. Include ALL airbill numbers. (Fed Ex#: 123456789, 987654321, 132435465)
- 31) Samples Temp and Conditions Upon Receipt: Leave blank, lab will fill in.
- 32) Relinquished by: Sign and print name and place date and time here. Date should be on or after date collected. (See the SOP for custodial instructions)
- 33) Received by: Sign and print name and place date and time here. (See the SOP for custodial instructions)

**Attachment 1**

**EXAMPLE  
SAMPLE LABEL**

Project Name: _____	Project No: _____
Sample ID: _____	
Sample Date: _____	Sample Time: _____
Sampler(s): _____	
Analyses: _____	
Preservatives: _____	

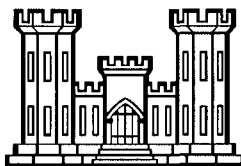
**EXAMPLE  
CUSTODY SEAL**

Signature: _____	
Date: _____	Time: _____

**SAMPLING AND ANALYSIS PLAN**  
**PART 2 - QUALITY ASSURANCE PROJECT PLAN**  
**REMEDIAL DESIGN**  
**FINAL**  
**OPERABLE UNIT 1**  
**CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE**  
**SOUTH PLAINFIELD, NEW JERSEY**

**Contract Number W912DQ-05-D-0001**  
**Task Order Number 001**

*Prepared for:*



**U.S. ARMY CORPS OF ENGINEERS**  
**KANSAS CITY DISTRICT**  
**Federal Building 601 E. 12<sup>th</sup> Street**  
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*Prepared by:*

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**CAPE Project Number 50001.001**  
**October 2005**

**SAMPLING AND ANALYSIS PLAN**  
**PART II – QUALITY ASSURANCE PROJECT PLAN**

**REMEDIAL DESIGN**  
**FINAL**  
**OPERABLE UNIT 1**  
**CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE**  
**SOUTH PLAINFIELD, NEW JERSEY**

**Contract Number W912DQ-05-D-0001**  
**Task Order 001**

**October 2005**

The following Plan has been prepared in response to a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Record of Decision (ROD) and the signatories below have reviewed and approved the plan for compliance with project requirements.



10/26/05

Approved by: \_\_\_\_\_  
Michael Lamon  
Cape Environmental  
Project Manager

Date



10/26/05

Approved by: \_\_\_\_\_  
Charles Reed  
Cape Environmental  
CQCSM

Date



10/26/05

Approved by: \_\_\_\_\_  
Christelle Newsome    Date  
Cape Environmental  
Chemical Quality Control Officer

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- 2 Data Quality Objectives Summary for Soil Excavation Activities

### FIGURES

- 1 Sample Receipt Form

### ATTACHMENTS

- 1 Kemron Project Quality Objectives
- 2 Authorization Letters

## LIST OF ABBREVIATIONS AND ACRONYMS

%R	percent recovery
ADaPT	Automatic Data Processing Tool
ADR	Automatic Data Review
ASTM	American Society for Testing and Materials
bgs	below ground surface
CCC	calibration check compound
CCV	continuing calibration verification
CDFR	Chemical Data Final Report
CDQR	Chemical Data Quality Report
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	chain-of-custody
COR	Contracting Officer's Representative
CQAR	Chemical Quality Assurance Report
CQC	Contractor Quality Control
CQCO	Chemical Quality Control Officer
CQCSM	Contractor Quality Control System Manager
CQCSR	Chemical Quality Control Summary Report
DCQCR	Daily Chemical Quality Control Report
DEM	Data Element Map
DESA	Division of Environmental Science and Assessment
DODQSM	Department of Defense Quality Systems Manual for Environmental Laboratories
DOM	Document Object Model
DQO	data quality objectives
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
EML	Environmental Measurements Laboratory
FORMS II Lite™	Field Operations and Records Management System II Lite
FSP	Field Sampling Plan
GC/MS	gas chromatograph/mass spectrometer
HASL	Health and Safety Lab
ICP	Inductively Coupled Plasma
ICV	initial calibration verification
LQAM	Laboratory Quality Assurance Manual
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LDP	laboratory data package
LSPM	Laboratory Services Project Manager
MD	matrix duplicate
MDL	method detection limit
mg/kg	milligrams per kilogram
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
ND	nondetect
NELAP	National Environmental Laboratory Accreditation Program
NIOSH	National Institute for Occupational Safety and Health

NJAC	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NPL	National Priorities List
ODBC	Open Database Connectivity
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
PID	photoionization detector
PM	Project Manager
POTW	publicly owned treatment works
ppm	parts per million
PQL	practical quantitation limits
QA	quality assurance
QAO	quality assurance objective
QAPP	Quality Assurance Program Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RL	reporting limits
ROD	record of decision
RPD	relative percent difference
RSCC	Regional Sample Control Coordinator
RSD	relative standard deviation
SAP	Sampling and Analysis Plan
SEDD	Staged Electronic Data Deliverable
SOP	standard operating procedure
SOW	scope of work
SSHP	Site Safety and Health Plan
SVOC	Semivolatile Organic Compounds
TAL	target analyte list
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TSCA	Toxic Substances Control Act
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compounds
XML	Extensible Markup Language

## 1.0 PROJECT DESCRIPTION

This Quality Assurance Project Plan (QAPP) is Part II of the Sampling and Analysis Plan (SAP), which addresses the sampling and analysis activities to be conducted in support of the Operable Unit (OU) 1 Phase A removal activities at the former Cornell-Dubilier Electronics Corporation, Inc. (CDE) Superfund site in South Plainfield, New Jersey.

The QAPP elements provide policies, procedures, specifications, standards, and documentation sufficient to produce data of quality adequate to meet project objectives and to minimize loss of data due to out-of-control conditions or malfunctions. The FSP elements describe field procedures for the collection and analysis of samples at the NSRR project site. The QAPP was prepared in conformance with U.S. Environmental Protection Agency (EPA) *Guidance for Quality Assurance Project Plans (EPA QA/G-5)* (EPA, 2002), EM-200-1-3 *Requirements for the Preparation of Sampling and Analysis Plans*, U.S. Army Corps of Engineers (USACE) (2001), U.S. Department of Defense *Quality Systems Manual for Environmental Laboratories, Version 2 (DODQSM)* (DOD, 2004), and New Jersey Department of Environmental Protection (NJDEP) *Site Remediation Program, Field Analysis Manual*, (NJDEP, 1994). This QAPP should be used in conjunction with the Field Sampling Plan (FSP), the project Work Plan, and the project Site Safety and Health Plan (SSHP).

This QAPP addresses the sampling and analysis activities to be conducted in support of the tasks listed below:

- ▲ Soil sampling and analysis by field screening test kits to delineate lateral and vertical extents of polychlorinated biphenyl (PCB) contamination to determine the limits of the excavations at four properties
- ▲ Confirmation soil sampling and analysis by a fixed-base laboratory at four properties
- ▲ Testing for disposal profiling
- ▲ Testing of imported soils to be used as backfill are clean
- ▲ Perimeter air monitoring.

Sections 1.0 and 2.0 of the Work Plan describe the project including site history and contaminants, existing site data, and site-specific sampling and analysis problems. Issues addressed by the QAPP include:

- ▲ Project description
- ▲ Project organization and responsibilities
- ▲ Data quality objectives (DQOs)
- ▲ Sampling locations and procedures
- ▲ Sample custody and holding times
- ▲ Calibration procedures and frequency
- ▲ Analytical procedures
- ▲ Data quality evaluation
- ▲ Performance and system audits
- ▲ Preventative maintenance
- ▲ Calculation of data quality indicators
- ▲ Corrective actions
- ▲ Quality assurance (QA) reports.

## **2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES**

The project organization and responsibilities of the key project personnel are described in the sections below. All onsite personnel are responsible for complying with the requirements of the Work Plan, SSHP, Contractor Quality Assurance (CQC) Plan, and the SAP.

### **2.1 CAPE Personnel**

This section highlights the CAPE key personnel relevant to the data collection efforts at the CDE site. All CAPE key project personnel are highlighted in the personnel section work plan.

### **2.2 Analytical Laboratories**

Confirmation samples, including QA/quality control (QC) samples, will be analyzed by the EPA Region 2 Division of Environmental Science and Assessment (DESA) laboratory below.

U.S. EPA Facilities  
EPA Region 2 Division of Environmental Science and Assessment (laboratory)  
Raritan Depot  
2890 Woodbridge Avenue  
Edison, NJ 08837-3679  
POC: Jennifer Feranda  
(732) 321-6687  
POC: Adly Michael  
(732) 906-6161

Samples for disposal profiling, of imported soils to be used as backfill, and from perimeter air monitoring, including QA/QC samples, will be sent for analyses to:

Kemron Laboratory  
POC: Stephanie Mossburg  
109 Starlite Park  
Marietta, OH 45750  
(740) 373-4071  
(740) 373-4226

Samples from perimeter air monitoring, including QA/QC samples, will be sent for analyses to the following laboratory.

Princeton Laboratory  
47 Maple Avenue,  
Flemington, NJ 08822  
POC: Jane Dennison, Ph.D., CIH  
(908) 806-2620  
Fax: (908) 806-2409

General Engineering Laboratories  
POC: Tasha Horton

2040 Savage Road,  
Charleston, SC 29407  
Telephone: (843) 769-7378,  
Fax: (843) 769-7397

If the primary laboratory is unable to analyze the samples, a laboratory that can provide evidence through certificate and analyte list for National Environmental Laboratory Program (NELAP), USACE, and New Jersey state accreditation will be selected.

The contract laboratory(ies) shall have an organization with well-defined responsibilities for each individual in the management system to ensure that sufficient resources are available to maintain a successful operation. The laboratory shall maintain a staff of qualified personnel so that project quality requirements and schedules can be met. At a minimum, the contract laboratories shall retain individuals to function in the following roles: Sample Custodian, Technical Director, QA Officer, Services Project Manager, and analyst. The educational and experience requirements of laboratory project personnel will be as specified in the DODQSM.

## **2.3 Analytical Laboratory Key Personnel**

### **2.3.1 Laboratory Sample Custodian**

The samples will be delivered to the person in the laboratory authorized to receive samples (referred to as the Sample Custodian). Upon receipt of a sample, the custodian will take the temperature of the blank, inspect the condition of the samples and the custody seals, reconcile the information on the sample label against that on the chain-of-custody (COC) record, sign and date the COC record, assign a laboratory number, log the sample in the laboratory logbook, and store it in a secured sample storage room. The Sample Custodian will verify custody seals are intact and complete a laboratory sample receipt form (Figure 1) and fax it to the Program Chemist. This sample receipt form will establish sample integrity throughout custody procedures. It will include, at a minimum, time and date acquired, Sample Custodian's name, preservative check, cooler temperature, analyses to be performed, matrix type, method holding time and any special instructions. All discrepancies will be documented and immediately reported to the Laboratory Services Project Manager (LSPM) or their designee, who will immediately contact the Program Chemist, or designee, by telephone or facsimile. Until discrepancies are resolved, the laboratory will retain all packing materials for that sample shipment. Any deviations from accepted sample handling procedures will be documented, and the CAPE Project Manager (PM) will be informed. Corrective action may result in the collection of additional samples.

### **2.3.2 Laboratory Technical Director**

The contract laboratories shall have a Technical Director responsible for overall technical operations. The Laboratory Technical Director shall have sufficient authority and be responsible for actively supporting the implementation of the Laboratory QA Plan, participating in proficiency testing, certifying personnel have appropriate education and training, maintaining accurate standard operating procedures (SOPs) and enforcing their use in the laboratory, ensuring adequate supervision of technical staff, providing a contingency plan, having policies and procedures in place that ensure protection of client's confidential information and maintaining a work environment that emphasizes the importance of quality.

### **2.3.3 Laboratory Quality Assurance Officer**

The Laboratory QA Officer shall be responsible for maintaining the laboratory quality system and overseeing the QA aspects of the data. The Laboratory QA Officer shall develop, coordinate, and implement QA plans and procedures in support of laboratory's projects. The Laboratory QA Officer shall also be responsible for monitoring the laboratory's activities for compliance with this QAPP's policies and procedures and implementing corrective action procedures for any QA/QC deficiencies.

The Laboratory QA Officer/Manager should work independent of the Laboratory Director and have "stop work release" authority over all laboratory analyses. Additionally, the QA Officer/Manager should certify that the data is in compliance with the terms and conditions of the CAPE contract, SOW, both technically and for completeness as required by the project. The QA Officer should also ensure that release of the data contained in the hardcopy data package and in the computer-readable data submitted has been authorized by the QA Officer/Manager.

### **2.3.4 Laboratory Services Project Manager**

Functionally, the LSPM shall report to the Program Chemist. The LSPM, or designee, shall perform a final review of the data to determine if all analytical results of the samples are consistent. Correlation of results for different parameters of a sample is evaluated at this time before the data are presented in a final report to the client. If discrepancies or deficiencies exist in the analytical results, then corrective action is taken. The LSPM shall verify all environmental samples are analyzed for requested parameters, notify the Program Chemist of any laboratory nonconformances, and provide laboratory results to CAPE for the inclusion of data in project reports.

### **2.3.5 Laboratory Analysts**

The laboratory analyst generates the data (i.e., log in, prepares, and/or runs the samples) and is responsible for primary review of those data. The primary review is often referred to as a "bench-level" review. One of the most important aspects of primary review is to make sure that the test instructions are clear, and that all project-specific requirements have been understood and followed. Once the analysis is complete, the primary reviewer ensures that sample preparation information is complete, accurate, and documented; calculations have been performed correctly; quantitation has been performed accurately; qualitative identifications are accurate; client-specific requirements have been followed; method and process SOPs have been followed; method QC criteria have been met; QC samples are within established limits; dilution factors are correctly recorded and applied; nonconformances and/or anomalous data have been properly documented and appropriately communicated; and COC procedures have been followed. If the instrument calibration and recoveries of all QC samples are within specified tolerances, then the data are presented for secondary review. If instrument calibration or the recoveries of any QC samples exceed specified tolerances, then affected sample results are evaluated and generally the samples are submitted for reanalysis. Any manual integration that occurs is dated and signed and, if appropriate, noted in the case narrative.

## 2.4 Key Personnel

The key project management and regulatory personnel involved in this project are provided below:

U.S. EPA-Pietro Mannino  
290 Broadway Avenue  
New York, NY 10007  
e-mail: mannino.pietro@epamail.epa.gov  
phone: 212.637.4395

NJDEP-Carlton Bergman  
PO Box 402  
Trenton, NJ 08625  
e-mail: carlton.bergman@dep.state.nj.us  
phone: 609-633-6621

USACE-Contracting Officer's Representative (COR) Gene Urbanik, PE, PP  
US Army Corp of Engineers, New York District  
214 State Highway 18  
East Brunswick, NJ 08816  
e-mail: Neal.F.Kolb@nan02.usace.army.mil  
phone: 908-243-0118

USACE-alternate COR/Environmental Resident Engineer Neal Kolb, PE  
US Army Corp of Engineers, New York District  
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USACE-alternate COR/Project Engineer  
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214 State Highway 18  
East Brunswick, NJ 08816  
e-mail: patrick.nejand@nan02.usace.army.mil  
phone: 732-356-7623

In addition to these personnel, the following Cornell Dubilier team members will receive copies of the approved documents and any subsequent revisions:

USACE Senior Project Manager  
Garth Anderson  
US Army Corps of Engineers, Kansas City District  
601 E. 12<sup>th</sup> Street,  
Kansas City, MO 64015  
e-mail: h.garth.anderson@nwk02.usace.army.mil  
phone: 816-983-3255

USACE Project Engineer  
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U.S. Army Corps of Engineers, Kansas City District  
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phone: 816-983-3709

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phone: 865-671-1142

CAPE's Site Superintendent  
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CAPE's CQCSM  
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Exton, PA 19341  
e-mail: [creed@cape-inc.com](mailto:creed@cape-inc.com)  
phone: 610-594-8606

CAPE's Site Safety and Health Officer  
Ken Beatty  
2302 Parklake Drive, Suite 200  
Atlanta, GA 30345-2907  
e-mail: [kbeatty@cape-inc.com](mailto:kbeatty@cape-inc.com)  
phone: 770-908-7200

CAPE's Chemical Quality Manager/Program Chemist  
Christelle Newsome  
2302 Parklake Drive, Suite 200  
Atlanta, GA 30345  
e-mail: [cnewsome@cape-inc.com](mailto:cnewsome@cape-inc.com)  
main phone: 770-908-7200  
direct phone: 678 287 1358  
fax number: 770 908 7219

### 3.0 QUALITY ASSURANCE OBJECTIVES

Quality assurance objectives (QAOs) are the detailed QC specifications for precision, accuracy, representativeness, comparability, and completeness (collectively referenced as PARCC). The QAOs established in this QAPP should be used for both SAP development and data quality review. Regarding measurement data quality, the QA/QC program QAOs shall:

- ▲ Provide a mechanism for the ongoing control and evaluation of measurement data quality
- ▲ Provide measures of data quality in terms of PARCC to assess whether the data meet the project objectives and can be used for their intended purpose.

The primary objective of the chemical measurement data collected at the CDE OU-1 removal activities is to generate sufficient information to determine the presence or absence of PCB contamination of the soils in the excavations at four properties. The chemical measurement data shall be used to determine if results exceed project cleanup objectives/action levels, to delineate lateral and vertical extents of PCB contamination to determine the limits of the excavations at the four properties, and characterize the soils to determine the disposal alternatives of the site's waste. Chemical measurement data will also be collected to ensure the backfill source provides clean backfill; and chemical measurement data will be collected from perimeter air monitoring to ensure compliance with action levels established in the record of decision (ROD) for interior dust. Data acquired during the sample collection phase must be defensible. The quality objectives for the chemical measurement data specify the "quality" of the data needed to enable project personnel to make decisions (e.g., hazardous or nonhazardous waste). As such, the QAOs determine the type and quantity of data needed to make a decision, as well as the measurement quality objectives (precision, accuracy) for each type of measurement data collected. The DQO process defines the project objectives in the form of a decision agreeing upon the criteria used to make a decision and the acceptable level of uncertainty (or error) in making a wrong decision. The DQO process shall follow the requirements of *EPA Guidance for Data Quality Objectives Process, EPA QA/G-4, EPA 600/R-96-055* (EPA, 2000).

Full comprehensive data packages (results and all supporting documentation) will be produced by standard laboratory instrumentation using Contract Laboratory Program (CLP) and EPA- and National Institute of Occupational Safety and Health (NIOSH)-approved methodology. These methods provide low detection limits, defined and potentially rigorous QC, a wide range of calibrated compounds and analytes, matrix recovery and homogeneity information, laboratory process control information, and a fully acceptable level of documentation. Laboratory deliverables will include all applicable QC information as defined in Section 12.3.2 and raw data packages to resolve any outstanding QC issues determined during the data validation process. These data can be used for all phases of this project.

#### 3.1 Background

The former CDE facility is located at 333 Hamilton Boulevard, South Plainfield, Middlesex County, New Jersey. The site includes three operable units. OU-1 consists of residential, commercial, and municipal properties located in the vicinity of the former CDE facility. OU-2 addresses contaminated soils and buildings at the former CDE facility. OU-3

addresses the contaminated groundwater and contaminated sediments of the Bound Brook. This QAPP is for OU-1 removal activities.

CDE operated at the site from 1936 to 1962, manufacturing electronic components including, in particular, capacitors. PCBs and chlorinated organic solvents were used in the manufacturing process. These activities evidently led to widespread chemical contamination at the facility, as well as migration of contaminants to areas nearby. Since CDE's departure from the facility in 1962, it has been operated as a rental property, with more than 100 commercial and industrial tenants. As a result of the contamination found at the facility, CDE is on the EPA's National Priorities List (NPL). EPA is the lead agency and the NJDEP is the support agency. Additional information on the background of the site is provided in the ROD (EPA, 2003a).

### **3.1.1 Project Objectives**

The project cleanup objective for PCBs is 1 part per million (ppm). The scope of work (SOW) is discussed in the Work Plan and FSP; thus, are not discussed here further.

### **3.1.2 Measurements Required to Meet Project Objectives**

Table 1 in the FSP provides a summary of the number and type of field samples required for chemical constituent measurement for each sample matrix.

## **3.2 Data types**

The two categories of data generated as part of this project are defined as (1) screening and (2) definitive data.

Screening data are generated from rapid analysis methods performed in the field and do not require a formal data package deliverable. Sample preparation, QC, and instrument calibration requirements are much less rigorous than those associated with definitive methods. Screening methods may provide analyte identification and quantitation or may be physical measurements such as temperature, pH, or conductivity. For this project, SDI Ensyst PCB Immuno-Assay Sampling Kits (hereafter referred to as PCB field test kits) will be used.

Definitive analytical data are generated using rigorous methods such as those given in Contract Laboratory Program (CLP) method for Multi-Media, Multi-Concentration Organics Analysis, OLM04.3; CLP Multi-Media, Multi-Concentration Organics Analysis, SOM01.1; and *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA, 1986 and 1997) where not provided in the CLP methodology. Definitive methods provide confirmation of both analyte identification and quantitation. For this project these methods will be performed at offsite laboratories and have specific QC and documentation requirements.

## **3.3 QA Objectives for Chemical Data Measurement**

Objectives for data quality reflect the expected uses of the data, the expected levels of contamination, and the available analytical and sampling resources.

### 3.3.1 Data Uses

The primary uses of the chemical measurement data to be gathered are as follows:

- ▲ Soil sampling and analyses by PCB field screening test kits to delineate lateral and vertical extents of PCB contamination to determine the limits of the excavations at four properties. Split samples of the PCB field test kit nondetects (NDs) will be sent to the fixed-base laboratory to determine PCB concentrations are below 1 ppm, the EPA soil cleanup objective
- ▲ Confirmation soil sampling and analyses by fixed-base laboratory at four properties to confirm PCB concentrations are below 1 ppm, the EPA soil cleanup objective, and to document the conditions in the excavations
- ▲ Sample analyses of soils for disposal profiling
- ▲ Sample analyses of imported soils to be used as backfill to confirm as clean
- ▲ Perimeter air monitoring to ensure compliance with action levels established in the ROD for interior dust.

### 3.3.2 Precision, Accuracy, Representativeness, Completeness, and Comparability Data Quality Indicators

The project DQOs are expressed as a series of requirements for the sampling procedures, sample handling procedures, analytical procedures, and analytical sensitivity; as well as PARCC parameter goals for project QC check results. Quantitative DQOs are established for precision, accuracy, and completeness whereas representativeness and comparability are expressed qualitatively. Calculation of data quality results is discussed further in Section 10 of this QAPP.

**3.3.2.1 Precision.** Precision is a measure of the degree of reproducibility of an analytical value and is determined by analyzing duplicate samples. Precision may be affected by the natural variation of the matrix or contamination within that matrix, as well as by errors made in field and/or laboratory handling procedures. For chemical parameters that do not allow homogenization before sample acquisition (e.g., volatile organic analysis), precision values must be viewed accordingly.

Precision objectives for laboratory performance are expressed as the relative percent difference (RPD) of matrix duplicate (MD) or matrix spike duplicate (MSD) samples. These samples will be analyzed at a frequency of one per analytical batch or every 5 percent of samples, whichever is more frequent.

Precision objectives for field activities are expressed as RPD of field duplicate QC samples submitted "blind" to the subcontract laboratory. These samples will be analyzed at a frequency of one per every 10 samples for confirmation sampling.

**3.3.2.2 Accuracy.** Accuracy is a measure of bias in a measurement system (i.e., how closely an analytical result agrees with the true or actual value). Potential sources of error are the sampling process, field contamination, preservation, handling, sample matrix sample preparation, sample matrix interference, and analysis techniques.

Accuracy objectives for laboratory performance are expressed as percent recoveries (%R) of a known concentration of reference material added to a field sample matrix or a standard matrix. Every batch of samples analyzed shall include matrix spikes (MSs), MSDs, and laboratory control samples (LCSs). MS results are used to evaluate the ability of the analytical method to measure the analytes of interest in the actual sample matrix and to verify analyses are conducted within control limits. LCS results are used to verify analyses are conducted within control limits. Laboratory-specific LCS and MS limits for each analytical method will be used when method-specific accuracy limits are not provided. MSs and LCSs will be analyzed at a frequency of one per analytical batch or 20 samples, whichever is more frequent.

**3.3.2.3 Representativeness.** Representativeness expresses the degree to which sample data accurately and precisely represent actual site conditions. Representativeness is a qualitative parameter most concerned with the proper design of the sampling program or subsampling of a given sample. The representativeness criterion is satisfied by employing appropriate sampling strategies and techniques. The representativeness of the data will be evaluated by:

- ▲ Comparing actual sampling procedures and (COC) forms to those described in the SAP
- ▲ Identifying and qualifying nonrepresentative data in site characterization activities
- ▲ Evaluating holding times and condition of samples upon arrival at the laboratory
- ▲ Examining blanks for cross contamination.

The objective of this SAP is to generate representative data. This shall be accomplished by using trained personnel and employing standardized and approved sampling and analytical procedures. These procedures shall be explicitly followed, with any exceptions thoroughly documented.

**3.3.2.4 Comparability.** Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. The comparability objective of this project is to generate data comparable with other measurement data for similar samples and sample conditions. This goal will be accomplished by using standard techniques to collect and analyze samples, following these methods and procedures explicitly, documenting any exceptions, and reporting results in appropriate units. Any planned deviation from procedures will be approved in advance and well documented. Analysis of reference samples may also be used to provide additional information that can be used to assess comparability of analytical data produced within the laboratory and among laboratories if more than one laboratory is used on the project.

Comparability is assessed by evaluating field duplicate sample results in conjunction with laboratory QA/QC results. Comparability can be assessed by comparing the QA sample results to its corresponding field duplicate(s). Duplicate samples, for QA or QC purposes, will be analyzed at a frequency of approximately one per every 10 primary samples collected, or as designated by the Contracting Officer's Representative (COR).

**3.3.2.5 Completeness.** Completeness is defined as the percentage of measurements made that are judged to be valid compared to the total number of measurements planned. A value of 90 percent or higher is the goal. For values less than 90 percent, problems in the sampling or analytical procedures will be examined and possible solutions explored.

**3.3.2.6 Sensitivity.** Reported PCB concentrations from the PCB confirmation soil samples will be compared with the 1 ppm EPA cleanup objective/action level for soil. Reported chemical concentrations from the waste characterization soil samples will be compared with maximum allowable Toxicity Characteristic Leaching Procedure (TCLP) concentrations to determine disposal requirements (40 Code of Federal Regulations [CFR] Part 261) (CFR, 2002b). At a minimum, this will be completed through the analysis of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, PCBs, metals, paint filter test, and hazardous characteristics of reactivity, corrosivity, and ignitability. Total PCB concentrations will also be evaluated to determine disposal requirements (i.e., less than 2 milligrams per kilograms [mg/kg] at an approved offsite disposal facility permitted to accept waste if less than 2 mg/kg). Sensitivity objectives will be expressed in terms of method detection limits (MDLs) and project reporting limits (RLs).

### **3.3.3 Method Detection Limits**

The MDL, based on the sensitivity of the instrument and performance of the method, is the smallest reported concentration in a sample within a specified level of confidence. MDLs for each instrument and matrix are laboratory specific and are determined statistically following the procedures outlined in 40 CFR Part 136, Appendix B (CFR, 2002a). MDLs are updated annually by the laboratory; therefore, may change somewhat over the course of a project; however, in all cases they shall remain consistent with those specified in CLP and SW-846 protocol. MDLs are calculated as follows:

$$\text{MDL} = t_{(n-1, 1-\alpha = 0.99)} (S)$$

Where:

$t_{(n-1, 1-\alpha = 0.99)}$  = Students' t-value appropriate to a 99 percent confidence level and a standard deviation estimate with n-1 degrees of freedom.

S = standard deviation of the replicate analyses.

### **3.3.4 Project Reporting Limits**

Project RLs are based on the CLP contract-required detection limits. MDLs and practical quantitation limits (PQLs), which are typically the same as the laboratory's RLs, for the various analytical parameters anticipated for this project are provided in Attachment 1.

### **3.3.5 Laboratory Reporting Requirements and Sensitivity**

The laboratory shall report concentrations of constituents detected above the MDL but below the RL as estimated "J." Constituents not detected shall be reported as not detected "U" at the RL.

#### 4.0 DATA QUALITY OBJECTIVES

The sampling and analysis program is designed to meet specific DQOs. Data generated from sampling and analysis will be verified against the DQOs to determine if the data are of sufficient quality to be used in meeting the project objectives. The DQO process shall follow the requirements of EPA Guidance for Data Quality Objectives Process, EPA QA/G-4, EPA 600/R 96-055 (EPA, 2000).

Table 2 provides a DQOs Summary for Soil Excavation Activities.

The DQO process consists of the seven steps outlined below:

1. State the problem.
2. Identify the decisions.
3. Identify inputs to decisions.
4. Define the study boundaries.
5. Develop decision rules.
6. Specify tolerable limits on decision errors.
7. Optimize investigation design for obtaining data.

The DQO process flow that will be used for the site involves the following seven steps:

1. State the problem to be resolved. Establish the planning team, including the decision makers; describe the problem and develop a conceptual model of the environmental hazard to be investigated; and identify available resources, constraints and deadlines.
2. Identify the decision to be made. Identify the principle study question; define alternative actions; combine the principle study question alternative actions into a decision statement and state each decision in terms of whether to take action; and organize multiple decisions into an order of priority.
3. Identify the inputs to the decision. Identify the information needed to support the decision and specify the inputs requiring environmental measurements; determine the basis for setting the action level; and identify actual sampling and analytical methods that can meet the data requirements.
4. Define the boundaries of the study. Specify the spatial and temporal aspects of the environmental media that the data must represent to support the decision.
5. Develop a decision rule. Develop a decision rule statement that defines the conditions that would cause the decision maker to choose among alternatives; define the action levels or criteria that sets the boundary between one outcome of decision process and another outcome; and confirm that the action levels exceed measurement detection levels.
6. Specify the tolerable limits on decision errors. Specify the decision maker's acceptable limits on decision errors, which are used to establish appropriate performance goals for limiting uncertainty in environmental data. The summary statistics used for evaluation are included in this step. Also, the data users must determine the acceptable level of confidence needed for the objectives.

7. Optimize the design for obtaining the data. Develop a resource-effective sampling and analysis design for generating data that are expected to satisfy the DQOs.

#### **4.1 Stating the Problem**

The primary objective of the proposed remedial action is to excavate PCB-contaminated soils from four properties at the CDE site. Confirmation soil sampling with analyses by fixed-base laboratory at four properties will be used to confirm PCB concentrations are below 1 ppm, the EPA soil cleanup objective, and to document the conditions in the excavations. Chemical measurement data collected during this effort shall also be used to determine the source used for backfill is clean. Additionally, perimeter air monitoring will be performed to ensure compliance with action levels established in the ROD for interior dust. Sampling will be performed as summarized in Table 1 of the FSP.

#### **4.2 Identifying the Decision**

The primary decision to be made during the excavation soil sampling (i.e., PCB field test kit soil samples, split samples, and confirmation soil samples) is to delineate lateral and vertical extents of PCB contamination to determine if results exceed project cleanup objectives/action levels and to determine the limits of the excavations at the four properties. Soil samples will be analyzed for PCBs by field test kits and CLP OLM04.3. Split samples of the PCB field test kit NDs will be sent to the fixed-base laboratory to determine PCB concentrations are below 1 ppm, the EPA soil cleanup objective. Confirmation sampling will occur on a 20 percent frequency to field screening samples to confirm left-in-place concentrations. Sampling will be performed at each excavation as stated in Table 1 of the FSP and summarized in Table 2 of this QAPP. An estimated 1,170 tons (based on 1.5 ton per cubic yard conversion factor) of soil are expected to be excavated. The primary decisions will be based on the analytical results obtained from PCB field test kit and confirmation samples as follows:

- ▲ The primary decision is composed of the following question: Do chemical concentrations in any of the samples exceed the 1 ppm EPA soil cleanup objective? In order to remediate CDE properties, the left-in place PCB concentrations must be below the 1 ppm EPA cleanup objective/action level and reported at or below 0.49 ppm. If the results do not exceed the 1 ppm EPA soil cleanup objective, then the material is left-in place. The excavated soils will then be disposed of according the appropriate waste section in the FSP. If the results exceed the 1 ppm EPA cleanup objective/action level, further sampling will be performed and analyzed by PCB field test kits and confirmation samples will be sent to the fixed-base laboratory for PCB analyses.

The primary decision to be made from the waste profiling sampling (excavated soil material and derived wastewater [decontamination wastewater]) is to determine if results exceed the regulatory requirements for nonhazardous and hazardous waste disposal requirements or project cleanup objectives/action levels. Soil samples for waste profiling will also be analyzed for TCLP VOCs, SVOCs, Pesticides, Metals, and PCBs, Paint Filter Test, Reactivity, Corrosivity, and Ignitability, as listed in Table 1 of the FSP. Decontamination wastewater samples, if there is any decontamination wastewater, will also be analyzed for TCL VOCs, SVOCs, Pesticides, TAL Metals, PCBs Reactivity, Corrosivity, and Ignitability

as listed in Table 1 of the FSP. The primary decisions will be based on the analytical results obtained from waste profiling/waste characterization samples as follows:

- ▲ The primary decision is composed of the following question: Do chemical concentrations in any of the samples exceed the regulatory requirements or local publicly owned treatment works (POTWs) discharge (if there is any wastewater) criteria? If the results do not exceed the regulatory requirements or discharge criteria, then the material is in compliance with the provisions of the regulations (including disposal requirements). Soils and water (if there is any wastewater) will then be disposed of appropriately. If the results exceed the regulatory requirements (40 CFR Part 261) or disposal requirements, the soils must be disposed off site in an approved Resource Conservation and Recovery Act (RCRA) Subtitle C or D landfill or a Toxic Substances Control Act (TSCA) landfill (as appropriate) and the wastewater (if there is any) must be disposed at an approved RCRA treatment and disposal facility. Wastewater is not anticipated; therefore, POTW discharge criteria have not been identified at this time. However, if wastewater is produced, it is anticipated it will be analyzed for target analyte list (TAL) metals and other parameters as stated above and compared to the 40 CFR Part 261 TCLP action limits. Additional parameters or regulatory limits may be identified by the POTW.

Chemical measurement data collected during this effort shall also be used to determine the source used for backfill is clean. Backfill (both general fill and topsoil) will be analyzed for TCL VOCs, TCL SVOCs, TCL Pesticides, PCBs, Herbicides, TAL Metals, Radium 226 Grain Size, and Standard Proctor, as listed in Table 1 of the FSP. Additionally, perimeter air monitoring will be performed to ensure compliance with action levels established in the ROD for interior dust. Air samples will be analyzed by National Institute for Occupational Safety and Health (NIOSH) 5503. Please refer to the SSHP for further details. Acceptability will be determined by evaluating the analytical results against the NJDEP criteria as indicated in New Jersey Administrative Code (NJAC) 7:26D.

#### **4.3 Identifying Inputs to the Decision**

Information required to make primary decisions is as follows:

- ▲ The analytical results for the excavation soil sampling (i.e., PCB field test kit soil samples, split samples, and confirmation soil samples), waste profile samples, backfill samples, and perimeter air monitoring samples collected at the site as stated in Section 4.2

Specifically regarding the excavation sampling:

- ▲ PCB field-screening measurements will be used to delineate excavation boundaries. PCB field test kit sampling will step out in 5- by 5-foot grid sampling increments at 6- inch depth intervals until 3 feet below ground surface (bgs). (If PCB are greater than 1.0 ppm bgs screen measurements will cease; the agencies will be consulted regarding steps need to proceed)
- ▲ PCB field test kit sample locations will be marked with pin-flags. When PCB field test kit results are ND, then split samples will be sent to the fixed-base laboratory for

PCBs analyses. These split samples will provide definitive data for verification/confirmation.

- ▲ PCB field-screening of the excavation base will consist of five grab samples composited from a 900 square foot area and five grab samples composited from each sidewall of the 900 square foot excavation. Confirmation sampling will occur on a 20 percent frequency to PCB field screening samples to confirm left-in-place concentrations.

Analytical methods that meet the project cleanup objectives/action levels will be used for the excavation soil samples (i.e., PCB field test kit soil samples, split samples, and confirmation soil samples), waste profile samples backfill samples, and perimeter air monitoring samples collected at the site. U.S. EPA standardized methods will be used for sampling and analysis, reporting data in standard units, and using standard and comprehensive reporting formats to achieve comparability with past and future sampling activities.

#### 4.4 Defining the Boundaries

There are four properties from which PCB-contaminated soil will be excavated during the OU-1 Phase A work effort:

- ▲ ] Addresses redacted
- ▲ ]
- ▲ ]
- ▲ ]

An illustration of each property is provided in Figures 2 through 6 of the Work Plan. The property boundaries depicted on these figures illustrate the lateral boundaries of investigation and excavation activities, which are contingent on language in the access agreements obtained by U.S. EPA. The data will be collected well in advance of excavation activities to ensure that the data has undergone a thorough review to verify technical adequacy. Sample collection is anticipated in the fall of 2005 with excavation likely occurring in the Spring of 2006. The data collected from the sampling event will be used to refine the excavation areas and will be presented to U.S. EPA for concurrence before excavation activities begin. These excavation areas will be illustrated using surveyed coordinates (as well as the sample locations) to ensure that field control during excavation is maintained, thereby ensuring that the contaminated soil has been removed.

#### 4.5 Develop a Decision Rule

Results from PCB field-screening measurements will be used to delineate excavation boundaries based on the horizontal and vertical extents of contamination. When PCB field test kit results are ND, then split samples will be sent to the fixed-base laboratory for PCBs analyses. In addition, confirmation sampling will occur on a 20 percent frequency to PCB field screening samples to confirm left-in-place concentrations. These split samples will provide definitive data for verification/confirmation. The decision rules relate to whether or not the concentrations of contaminants (PCBs) meet the requirements outlined below.

The initial decision for the excavation soil samples (i.e., PCB field test kit soil samples, split samples, and confirmation soil samples) will be based on a comparison of analytical results

to the *EPA Guidance for Data Quality Objectives Process, EPA QA/G-4, EPA 600/R 96-055* (EPA, 2000). The decision statements are described below:

- ▲ If excavation soil samples meet the 1 ppm EPA cleanup objective for PCBs (Table 1), the soil underneath the excavated soils may be considered uncontaminated and no further excavation in this area is required
- ▲ If excavation soil samples exceed the 1 ppm EPA cleanup objective for PCBs (Table 1), the soil below the excavated soils may be considered contaminated and further excavation and sampling will be required.

The initial decision for the waste profile samples will be based on a comparison of analytical results to the TCLP regulatory criteria, 40 CFR Part 261 (and disposal facility requirements). The decision statements are described below:

- ▲ If waste passes the TCLP criteria, and has PCB concentrations less than 2 ppm, then the materials may be placed in an approved landfill
- ▲ If waste passes the TCLP criteria, but contains between 2 and 50 ppm PCBs, then the materials will need to be disposed off site at an approved landfill
- ▲ If waste fails the TCLP criteria but passes the TSCA (PCB) requirements, then the materials will need to be disposed off site at an approved RCRA Subtitle C or D landfill facility (and wastewater must be disposed at an approved RCRA treatment and disposal facility)
- ▲ If waste contains PCB concentrations greater than 50 ppm, then the materials will need to be disposed off site at an approved TSCA facility.

#### **4.6 Specifying Limits on Decision Errors**

Limits on decision errors specify the tolerable limits of errors, based on potential consequences of making an incorrect decision. Since decisions are predominately based on analytical data, decision errors may result from the limits of the analyses. To limit decision errors, analytical method requirements have been established. Sampling and analyses will follow established SOPs and approved methods, respectively. Decision errors are discussed in the following subsection.

#### **4.7 Optimizing Sampling Design**

Sampling locations have been selected to provide sufficient information to make decisions regarding the attainment of system compliance, and thus, risk levels protective of human health. The sample design will attempt to identify historical sampling locations where PCBs were detected. The historical data was based on a 10- by 10-foot grid with samples collected at the grid nodes. Current excavation quantities are based on excavating soil to the clean boundaries based on the historical grid pattern (10 feet by 10 feet). To avoid excavation of excessive amounts of uncontaminated soil, CAPE's sampling plan will refine the excavation areas both laterally and vertically to ensure that the overexcavation of uncontaminated soil is minimized. The basis for selecting the 5- by 5-foot grid for this sampling event is based upon a measurable quantity of soil that would be transported and disposed (i.e., 5- by 5- by 1-foot is likely equivalent to 1 ton of soil).

Laboratory measurement procedures have been selected based on established and well-recognized technology and methods. All the methods used in this project originated with the EPA and/or NIOSH.

To design the most resource-effective study that can achieve the DQOs of this remedial action, the least expensive sampling methods that are in compliance with regulatory requirements have been selected. The DQOs are based on the objectives of the study to gather data that will be used to effectively remediate the four properties on the CDE facility and properly dispose of soil material to meet regulatory requirements.

The accuracy provided by the selected methods is deemed adequate to achieve the DQOs. The impact of statistical variability in data collected using the selected sampling methods is not significant. In summary, the sampling design is optimized based on cost and regulatory acceptance.

## **5.0 SAMPLING LOCATIONS AND PROCEDURES**

### **5.1 Field Documentation Requirements**

The project will have a dedicated logbook. the project name and location, and the project number will be entered on the inside of the front cover of the logbook. It is recommended that each page in the logbook be numbered and dated. The entries shall be legible and contain accurate and inclusive documentation of an individual's project activities. At the end of all entries for each day, or at the end of a particular event, the sampler should draw a diagonal line and initial indicating the conclusion of the entry. Since field records are the basis for later written reports, language shall be objective, factual, and free of personal feelings or other terminology that might prove inappropriate. Once completed, these field logbooks become accountable documents and must be maintained as part of the official project files. All aspects of sample collection and handling, as well as visual observations, shall be documented in the field logbooks.

### **5.2 Sampling Procedure Requirements**

Project-specific sampling rationale, sampling procedures, and the number and types of samples to be collected for each sample matrix are presented in the FSP. The following general sampling requirements will be maintained during all sampling:

- ▲ Dedicated or disposable sampling equipment will be used to the greatest extent practicable
- ▲ All nondedicated sampling devices will be thoroughly decontaminated before and after use
- ▲ The analytical laboratory will provide precleaned sample containers. All sample container records will be maintained by the analytical laboratory and will be available upon request
- ▲ A sample that is representative of the matrix being sampled will be collected

- ▲ Sample integrity will be maintained from the time of sample collection to receipt by the laboratory.

All field notes will be recorded in indelible ink on standard forms in bound notebooks. The Contractor Quality Control System Manager (CQCSM) will complete a daily field log. This log will be signed and dated daily. Significant events occurring during the day will be recorded and reported to the PM. Daily communication is essential to evaluate whether timely corrective actions are necessary. The field logbook(s) must provide a place for the field team members to sign and date the entries. The CQCSM must review all field notes.

### **5.3 QA/QC and Blank Samples**

Various QA/QC samples will be collected during the project to provide a mechanism to evaluate the attainment of project DQOs. The estimated number of QA/QC samples to be collected is presented in Table 1 of the FSP. The types of QA/QC samples planned are discussed below. Due to the nature of the project, not all types of QA/QC samples are applicable to this project.

#### **5.3.1 Field Duplicates**

A field duplicate sample is a second sample collected at the same location as the original sample. Duplicate samples are collected simultaneously or in immediate succession, using identical recovery techniques, and treated in an identical manner during storage, transportation, and analysis. The sample containers are assigned an identification number in the field such that they cannot be identified (blind duplicate) as duplicate samples by laboratory personnel performing the analysis. Specific locations are designated for collection of field duplicate samples before the beginning of sample collection.

Duplicate sample results are used to assess precision of the sample collection process. Precision of soil samples to be analyzed for VOCs is assessed from co-located samples because the compositing process required to obtain uniform samples could result in loss of compounds of interest. Field duplicates will only be collected for soil confirmation samples and will be collected at a rate of 10 percent of the environmental samples (one per every 10 confirmation soil samples). Duplicates will not be collected for waste samples.

#### **5.3.2 Trip Blank**

The trip blank consists of a VOC sample vial prepared in the laboratory with American Society for Testing and Materials (ASTM) Type II reagent-grade water, transported to the sampling site, stored and transported with the environmental samples, and returned to the laboratory for analysis. Trip blanks are not opened in the field. Trip blanks are used to assess the potential introduction of contaminants from sample containers or during the transportation and storage procedures. One trip blank shall accompany each cooler of samples sent to the laboratory for analysis of VOCs.

Trip blanks are not expected to be required for this project.

### **5.3.3 Matrix Spike/Matrix Spike Duplicate**

MS/MSD samples will be collected and shipped to the laboratory for spike analyses. MS/MSD samples will be collected at a rate of 1 set per 20 soil confirmation samples collected. However, if a spike sample has not been collected in a 14-day time period, a spike sample will be collected and sent for analyses. Table 1 of the FSP shows that additional sample volumes are required for MS/MSD samples. Only site-specific soil will be used to perform MS/MSD analyses for project samples. The site-specific sample selected for MS/MSD analysis will be identified on the COC.

### **5.3.4 Equipment Blanks**

Equipment blanks (rinsates) are samples of ASTM Type II water passed through and over the surface of decontaminated sampling equipment. They are used to measure the effectiveness of the decontamination process. Equipment blanks are collected and will reflect the types of equipment and samples taken. If more than one type of equipment is used to obtain samples for a particular matrix, equipment blanks will be collected from each representative group of equipment. Equipment blanks are analyzed for the same analytes as samples collected that day (refer to Table 1 of the FSP).

### **5.3.5 Field Blanks**

Field blanks (also referred to as ambient condition blanks or ambient blanks) are samples of ASTM Type II water used for decontamination and steam cleaning poured at ambient (current) conditions into a sample container at the field site. At a minimum, one sample for each source of water or one field blank per lot number of ASTM Type II water for a given sampling event will be collected for analysis when conditions indicate that ambient conditions could influence quantitation. In defining the number of field blanks required, it is important to note that a sampling event is defined as the period beginning when sampling personnel arrive at the installation and ending when personnel leave for more than 24 hours. If more than one lot number of ASTM Type II water is used, additional field blanks must be taken because these constitute different sources (refer to Table 1 of the FSP).

## **6.0 SAMPLE CUSTODY AND HOLDING TIMES**

To preserve the quality and integrity of samples from time of collection until time of analysis, sample custody, documentation, preparation, preservation, storage, and shipment procedures have been established. The appropriate type and number of sample containers, method of preservation, and analytical holding times are summarized in Table 1 of the FSP. Additional custody procedures are discussed in the FSP.

### **6.1 Required Use of EPA FORMS II Lite™**

This project requires the use of EPA's Field Operations and Records Management System II Lite™ (FORMS II Lite™). EPA developed FORMS II Lite™ to assist samplers with generating their sample documentation and to track samples. FORMS II Lite™ requires the use of laptop computers and/or handheld computing devices in the field by field personnel. FORMS II Lite™ is a flexible and easy-to-use, stand-alone, Windows-based application software that simplifies and accelerates the sample documentation process, reducing the generation of hand written documents by almost 70 percent. Specifically, FORMS II Lite™:

- ▲ Generates sample labels, bottle tags, and COC forms
- ▲ Tracks samples from the field to the laboratory
- ▲ Facilitates electronic capture of sample information into databases
- ▲ Exports data electronically as .xml, .dbf or .txt files.

### 6.1.1 FORMS II Lite™ Help References for Field Personnel

#### FORMS II Lite™ Help Desk:

Hours: 9a.m. - 5p.m. ET, M-F

Telephone: (703) 818-4200

#### FORMS II Lite™ Web Site:

The FORMS II Lite™ Web site <http://dyncsdao1.fedcsc.com/itg/forms2lite/> is the primary source for information, documentation, and support for managers, developers, and FORMS II Lite™ users.

### 6.1.2 Minimum System Requirements

Recommended minimum configuration requirements for the user's system are as follows:

- ▲ IBM PC or 100 percent Compatible
- ▲ Windows 98, NT, ME, 2000, or XP
- ▲ Internet Explorer 4.0 or higher
- ▲ 200MHz Pentium processor
- ▲ 32MB RAM (64MB is recommended)
- ▲ 35MB available hard disk space
- ▲ 2X CD-ROM drive
- ▲ 800x600 resolution using small fonts
- ▲ Mouse interface, printer, and remote power source for field use.

## 7.0 ANALYTICAL PROCEDURES

The objective of the analytical effort is to provide sufficient information to determine the presence or absence of chemical contamination. Presence or absence of chemical contamination will be determined by detection, or nondetection, of target analytes in environmental samples. Results of chemical measurement analyses will be compared to the sampling and analysis criteria to determine whether DQOs have been met. One objective for the chemical measurement data is to use standard methods and controlled systems to collect and analyze samples.

The laboratory will provide analytical services that subscribe to appropriate procedures and protocols described herein. The environmental samples will be analyzed according to the EPA analytical methods provided in Table 1 of the FSP. Table 1 of the FSP lists analytical methodologies used for the analysis of soils to document the chemical characteristics of the soils left in place (confirmation soils), soils and wastewater (if there is any) to determine proper offsite transportation and disposal (waste profiling/characterization), to ensure that they are free from chemical contamination before being brought on site as backfill, and to ensure perimeter air samples are in compliance with action levels established in the ROD for interior dust. Only U.S. EPA- and NIOSH-approved analytical methods will be used. If a nonstandard method must be used, the laboratory shall be established and written SOPs shall be provided.

No method modifications are planned. If exceptions or modifications are found following project execution, the procedures used will be documented in the Chemical Data Quality Report (CDQR) prepared by CAPE along with the reason for the deviation. Equivalent methods will only be substituted for the listed methodology if prior approval by the USACE Contracting Officer is given.

## **7.1 Laboratory Data Packages**

A CLP data package will be submitted by the EPA Region 2 DESA laboratory for each sample delivery group. CLP-like or Level IV data package laboratory data Package (LDP) will be submitted by the laboratory for each sample delivery group.

## **7.2 Analytical Constituent Lists and Reporting Limits**

Confirmation sampling to characterize the soils to be left on site will be performed using *U.S. EPA CLP OLM04.3 Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration Organics Analysis* (EPA, 1999b) and *U.S. EPA CLP OLM04.3 CLP Contract Corrections/Modifications/Clarifications for Multi-Media, Multi-Concentration Organics Analysis*. (EPA, 2003b).

Waste profile sampling to characterize the soils to be disposed of and samples to ensure the backfill source is acceptable will be performed using U.S. EPA Test Methods for Evaluating Solid Waste: Physical/Chemical Methods (SW-846), Third Edition, Update III (EPA, 1997).

The list of constituents to be analyzed and their respective MDLs and PQLs are provided in Attachment 1. Attachment 1 also presents the project cleanup objectives/action levels and regulatory requirements for soil samples. The laboratory MDLs must not exceed the project cleanup objective/action limit for each constituent. Chemical concentrations in the waste profile samples will also be evaluated against offsite disposal facility's requirements as appropriate.

Perimeter air monitoring sampling to ensure compliance with action levels established in the ROD for interior dust will be performed using NIOSH Polychlorinated Biphenyls: Method 5503 (NIOSH, 1994).

## **8.0 CALIBRATION PROCEDURES AND FREQUENCY**

This section of the QAPP discusses the calibration procedures that will be used by the selected subcontracted laboratory(ies). The laboratory(ies) will be responsible for proper calibration and maintenance of laboratory analytical equipment. Manufacturer's guidance shall be followed for general upkeep. The calibration methods to be followed are specific, in detail, in the analytical methods and laboratory SOPs. These procedures specify the type of calibration, calibration material to be used, calibration and standard concentration, and frequency of calibration. Documentation of initial and continuing calibration checks will be kept on file and submitted as part of the laboratory data deliverable. The laboratory is required to take corrective action when measurement systems fail calibration QC criteria. Sample analysis shall not proceed until the calibration QC criteria have been met.

Calibration procedures for field instruments are addressed in the FSP.

## 9.0 INTERNAL QUALITY CONTROL CHECKS

The data quality evaluation process is used to assess the effect of the overall analytical process on the usability of the data. The two major categories of data evaluation are laboratory performance and matrix interferences. Evaluation of laboratory performance is a check for compliance with the method requirements and is a straightforward examination; either the laboratory did, or did not, analyze the samples within the limits of the analytical method. Evaluation of the matrix interferences is subtler and involves examination of several results including surrogate spike recoveries, MS recoveries, and duplicate sample results.

Before the analytical results are released by the laboratory, both the sample and QC data will be carefully reviewed to verify sample identity, instrument calibration, detection limits, dilution factors, numerical computations, accuracy of transcriptions, and chemical interpretations. Additionally, the QC data will be reduced and spike recoveries will be included in control charts, and the resulting data will be reviewed to ascertain whether they are within the laboratory-defined limits for accuracy and precision. Any nonconforming data will be discussed in the data package cover letter and case narrative. The laboratory will retain all the analytical and QC documentation associated with each data package. Such retained documentation need not be hard (paper) copy, but can be available on other storage media such as magnetic tape. However, the laboratory must be able to produce a hard copy of all the retained information upon request.

The LDP will be reviewed by the Program Chemists using the process outlined in the U.S. EPA Region 2 Data Validation SOPs and U.S. EPA *CLP National Functional Guidelines for Organic Data Review* (EPA, 1999a). This overall process is used regardless of whether the samples were analyzed using CLP methods or not. The data review and validation process is independent of the laboratory's checks. It focuses on the usability of the data to support the project data interpretation and decision-making process. Areas of review include LDP completeness, holding time compliance, initial and continuing calibration, spiked sample results, method blank results, and duplicate sample results. A data review worksheet will be completed for each LDP. Acceptance criteria for each area of review are specified in the analytical method or functional guidelines. For example, acceptance criteria for initial and continuing calibration are specified in each analytical method. Any nonconformances will be noted on the data review worksheets and the effect of the nonconformance on the overall usability of the data will be evaluated as part of the overall data quality evaluation.

Samples that do not meet the acceptance limit criteria will be indicated with a qualifying flag, which is a one- or two-letter abbreviation that indicates a problem with the data. Flags used in the text may include the following:

- U** Undetected. Analyte was analyzed for but not detected above the detection limit.
- J** Estimated. The analyte was present, but the reported value may not be accurate or precise.
- UJ** RL estimated. The analyte was not detected above the MDL, but the actual detection limit may be estimated.
- R** Rejected. The data were rejected because the corresponding QC data were not within the method-specified limits.

It is important to note that laboratory qualifying flags are included on the data summary forms that

are submitted to the project by the laboratory. However, during the data review and validation process, the laboratory qualifying flags are evaluated and replaced with validation flags if applicable.

Once each of the LDPs has been reviewed, and the data review worksheets completed, then the entire data set will be evaluated for overall trends in data quality and usability. Information summarized as part of the data quality evaluation may include chemical compound frequencies of detection, dilution factors that might affect data usability, and patterns of target compound distribution. The data set will also be evaluated to identify potential data limitation or uncertainties in the laboratory. Additional areas of review are discussed below.

### **9.1 Field and Laboratory Blank Contamination**

This review includes the appearance and concentration of target compounds in field and laboratory blanks as well as of environmental samples. Common field sampling and laboratory contaminants detected in blanks include acetone, methylene chloride, and phthalates. Acetone and methylene chloride are used to extract samples in the laboratory and hence are common laboratory contaminants. Phthalates are used as plasticizers, the most common of which is bis (2-ethylhexyl) phthalate, and are often introduced during sample handling.

According to the U.S. EPA Region 2 Data Validation SOPs and U.S. EPA Functional Guidelines (EPA, 1999), concentrations of these common contaminants detected in samples at less than 10 times the maximum concentration in the blanks can be attributed to field sampling and laboratory contamination rather than to environmental contamination from site activities. As a note, concentrations of common contaminants such as acetone, methylene chloride, and phthalates detected in both the sample and the corresponding blanks use the 10X rule. Concentrations of less common contaminants are multiplied by five rather than 10.

### **9.2 Surrogate Spike Recoveries**

Surrogate spike recoveries are compounds for each of the organic analytical methods. For gas chromatograph/mass spectrometer (GC/MS) analyses, surrogate spike compounds are the structural homologs of target compounds, often with deuterium substituted for hydrogen, and are therefore expected to behave in a similar manner during analysis. For GC analyses, surrogate spike compounds are structurally similar (but not identical) to target compounds, and again, should behave in a similar manner during analysis. Surrogate spike recoveries are used to monitor both laboratory performance and matrix interferences. Surrogate spike recoveries from field and laboratory blanks are used to evaluate laboratory performance because these blanks represent an ideal sample matrix. Surrogate spike recoveries for field samples are used to evaluate the potential for matrix interferences. When surrogate spike recoveries for field samples fall outside the method target acceptance windows, the samples are reanalyzed. If the surrogate spike recovery is still outside the acceptance window for the reanalyzed sample, then the sample results are qualified as affected by matrix interferences.

### **9.3 Matrix Spike Recoveries**

For this QC measure, three aliquots of a single sample are analyzed: one native and two spiked with the same concentration of MS compounds. Unlike the surrogate spike compounds, MS compounds are found on the method target compound list. Spike recovery

is used to evaluate potential matrix interferences as well as accuracy. The duplicate spike results are compared to evaluate precision. MS/MSD samples will only be collected during soil confirmation for this project.

#### 9.4 Duplicate Sample Results

Typically, one duplicate field sample will be collected for every 10 field samples. Both the native and duplicate samples are analyzed for the same parameters. Target compounds that are detected in both the native and duplicate samples can be compared and precision for the sample results calculated. Field duplicates will only be collected during soil confirmation sampling for this project.

#### 9.5 Reconciliation with Data Quality Objectives

The final activity of the data quality evaluation is an assessment of whether the data meets the DQOs. The goal of this assessment is to demonstrate that a sufficient number of representative samples were collected and the resulting analytical data can be used to support the project decision-making process. The following PARCC measures are used:

- ▲ **Precision** - is the agreement between duplicate results and can be estimated by comparing duplicate MS recoveries and field duplicate sample results
- ▲ **Accuracy** - is a measure of the agreement between an experimental determination and the true value of the parameter being measured. For organic analyses, each of the samples is spiked with a surrogate spike compound; for inorganic analyses, each sample was spiked with a known reference material before digestion. Each of these approaches provides a measure of the matrix effects on the analytical accuracy. Accuracy can be estimated from the analytical data and cannot be measured directly
- ▲ **Representativeness** - is a qualitative measure of the degree to which sample data accurately and precisely represent a characteristic environmental condition. Representativeness is a subjective parameter and is used to evaluate the efficacy of the sampling plan design. Representativeness is demonstrated by providing full descriptions of the sampling techniques and the rationale used for selecting sampling locations in the project scoping documents
- ▲ **Completeness** - is defined as the percentage of measurements that are judged to be valid compared to the total number of measurements made. A goal of 90 percent usable data is desired for this project.
- ▲ **Comparability** - is another qualitative measure designed to express the confidence with which one data set may be compared to another. The following factors affect comparability: sample collection and handling techniques, sample matrix type, and analytical method. Comparability is limited by the other PARCC parameters because data sets can be compared with confidence only when precision and accuracy are known. Data from one phase of an investigation to another can be compared when the same EPA-approved methods are used and LDP deliverables are similar.

## **10.0 CALCULATION OF DATA QUALITY INDICATORS**

### **10.1 Quality Control Measures**

The QC process includes those activities required during analytical data collection to produce data of known and documented quality. The analytical data acquired from QC procedures are used to estimate and evaluate the analytical results and to determine the necessity for, or the effect of, corrective action procedures. The field QC samples required for this analytical service are presented in Table 1 of the FSP.

#### **10.1.1 Method Blanks**

A method blank is a sample of analyte-free water that is treated as a sample in that it undergoes the same analytical process as the corresponding field samples. Method blanks are used to monitor laboratory performance and contamination introduced during the analytical procedure. Typically, one method blank is required per 10 or 20 samples (depending on the analytical method) or one per batch, whichever is more frequent.

#### **10.1.2 Matrix Spikes**

For inorganic analyses, a single sample is split and one portion is spiked with a known amount of reference material. For organic analyses, three aliquots of a single sample are analyzed, one native and two spiked with MS compounds. Unlike the surrogate spike compounds, MS compounds are found on the method target compound list (TCL). Spike recovery is used to evaluate potential matrix interferences as well as accuracy. The duplicate spike results are compared to evaluate precision. The MS compounds and method target acceptance ranges are summarized for each analytical method. Typically, one MS (inorganic) or MS/MSD sample (organic) is analyzed for every 20 samples of the same matrix.

#### **10.1.3 Surrogate Spikes Recoveries**

This QC measure is applicable only to organic analyses. Surrogate compounds are the structural homologs of target compounds, often with deuterium substituted for hydrogen, and are therefore expected to behave in a similar manner during the analysis. Surrogate spike recoveries are used to monitor both laboratory performance and matrix interferences. Surrogate spike recoveries from field and laboratory blanks are used to evaluate laboratory performance because these blanks represent an "ideal" sample matrix. Surrogate spike recoveries for field samples are used to evaluate the potential for matrix interferences. For field samples, when the surrogate spike recoveries fall outside the method target acceptance windows, the samples are reanalyzed. If the surrogate spike is still outside the acceptance window for the reanalysis, then the sample results are qualified as affected by matrix interferences.

### **10.2 Formulas for Calculating Data Quality Indicators**

The overall objective of the QA program is to ensure that the analytical results are reliable, reproducible, accurate, and complete. The PARCC parameters will be used to specify data quality requirements and evaluate the analytical system performance. Calculations to obtain these parameters are presented in this section.

### 10.2.1 Precision

Precision is a measure of variability between duplicate or replicate analyses, and is calculated for laboratory replicates. Precision will be estimated from analytical data and cannot be measured directly. The precision can be expressed in terms of RPD between duplicate determinations when the number of replicates is less than four or in terms of relative standard deviation (RSD) when four or more determinations are made. The precision of a duplicate determination can be expressed as the RPD, as calculated from the equation:

$$RPD = \frac{S - D}{\frac{(S + D)}{2}} \times 100$$

Where:

S = First sample value (original or MS spike value)

D = Second sample value (duplicate or MSD value).

### 10.2.2 Accuracy

Accuracy is a measure of the agreement between an experimental determination (measured value) and the accepted (true value) of the parameter being measured. Accuracy is estimated through the use of known reference materials or MS. Accuracy is calculated from analytical data and is not measured directly. Spiking of reference materials into an actual sample matrix is the preferred technique because it provides a measure of the matrix effects on the analytical accuracy. Accuracy will be determined through the analysis of spiked samples and analysis of standards with known concentrations. Accuracy goals for this project are to use reference materials of the highest known purity for calibrations and spiking, and analyze daily check samples to demonstrate instrument performance. Accuracy, typically defined as %R, is calculated by the following equation:

$$PERCENT\ RECOVERY = \frac{(C_2 - C_1)}{C_0} \times 100\%$$

Where:

C<sub>2</sub> = measured value of the spiked sample

C<sub>1</sub> = measured value of the unspiked sample

C<sub>0</sub> = known amount of the spike in the sample.

### 10.2.3 Completeness

Completeness is defined as the percentage of measurements judged to be valid compared to the total number of measurements made. Completeness is calculated using the formula:

$$\% \text{ Completeness} = \frac{\text{number of valid results (i.e. non-R flagged)}}{\text{Number of total possible results}} \times 100$$

Statistic	Symbol	Formula	Definition	Uses
Mean	$\bar{X}$	$\frac{\sum_{i=1}^n x_i}{n}$	Measure of central tendency	Used to determine average value of measurements
Standard Deviation	S	$\left( \frac{\sum (x_i - \bar{X})^2}{(n-1)} \right)^{1/2}$	Measure of relative scatter of the data	Used in calculating variation of measurements
Relative Standard Deviation	RSD	$(S / \bar{X}) \times 100$	Relative standard deviation, adjusts for magnitude of observations	Used to assess precision for replicate results
Percent Difference	%D	$\frac{x_1 - x_2}{x_1} \times 100$	Measure of the difference of two observations	Used to assess accuracy
Relative Percent Difference	RPD	$\left( \frac{(x_1 - x_2)}{(x_1 + x_2)/2} \right) \times 100$	Measure of variability that adjusts for the magnitude of observations	Used to assess total and analytical precision of duplicate measurements
Percent Recovery	%R	$\left( \frac{x_{\text{meas}}}{x_{\text{true}}} \right) \times 100$	Recovery of spiked compound in clean matrix	Used to assess accuracy
Percent Recovery	%R	$\frac{\left( \frac{\text{value of spiked sample} - \text{value of unspiked sample}}{\text{Value of added spike}} \right) \times 100}{1}$	Recovery of spiked compound in sample matrix	Used to assess matrix effects and total precision
Correlation Coefficient	r	see SW8000B section 7.5.3		Evaluation of "goodness of fit" of a regression line
Coefficient of Determination	COD	see SW8000B section 7.5.3		Evaluation of "goodness of fit" of a polynomial equation

x = Observation (concentration)

n = Number of observations

## 11.0 CORRECTIVE ACTIONS

### 11.1 Field Activities Corrective Actions

The PM is responsible for initiating corrective actions. Corrective action steps include problem identification, investigation responsibility assignment, investigation, action to eliminate the problem, increased monitoring of the effectiveness of the corrective action, and verification that the problem has been eliminated.

Documentation of the problem is important to the overall management of the study. A corrective action request form for problems associated with sample collection is completed

by the person discovering the QA problem. This form identifies the problem, establishes possible causes, and designates the person responsible for action. The responsible person will be either the PM or the CQCSM.

The correction action request form includes a description of the corrective action planned and has space for follow-up. The PM verifies that the initial action has been taken and appears to be effective and, at an appropriate later date, checks to see if the problem has been resolved fully. The PM receives a copy of all corrective action request forms and enters them into the corrective action log. This permanent record aids the PM in follow-up and assists in resolving the QA problems.

Examples of corrective action include, but are not limited to, correcting COC forms, analysis reruns (if holding time criteria permit), recalibration with fresh standards, replacement of sources of blank contamination, or additional training in sampling and analysis. Additional approaches may include the following:

- ▲ Resampling and reanalyzing
- ▲ Evaluating and amending sampling and analytical procedures
- ▲ Accepting the data and acknowledging the level of uncertainty or inaccuracy by flagging the validated data and providing an explanation for the qualification.

## **11.2 Laboratory Activities Corrective Actions**

The laboratory department supervisors review the data generated to verify that all QC samples have been run as specified in the protocol. Laboratory personnel are alerted that corrective actions may be necessary under the following conditions:

- ▲ QC data are outside the warning or acceptable windows for precision and accuracy established for laboratory samples
- ▲ Blanks contain contaminants at concentrations above the levels specified in the laboratory QAPP for any target compound
- ▲ Undesirable trends are detected in MS recoveries or RPD between MSDs
- ▲ There are unusual changes in detection limits
- ▲ Deficiencies are detected by the laboratory QA director during internal or external audits, or from the results of performance evaluation samples.

If a nonconformance appears in analytical methodologies, QC sample results are identified by the bench analyst, and corrective actions are implemented immediately. Corrective action procedures are handled initially at the bench level by the analyst, who reviews the preparation or extraction procedure for possible errors; and checks the instrument calibration, spike and calibration mixes, instrument sensitivity, and so forth. The analyst immediately notifies his/her supervisor of the problem that is identified and the investigation being made. If the problem persists or cannot be identified, the matter must be referred to the laboratory supervisor and QA/QC officer for further investigation. Once resolved, full documentation

of the corrective action procedure must be filed with the laboratory supervisor, and the QA/QC officer must be provided with a corrective action memorandum for inclusion into the project file if data are affected.

Corrective actions may include, but are not limited to, the following:

- ▲ Reanalyzing suspect samples
- ▲ Resampling and analyzing new samples
- ▲ Evaluating and amending sampling and analytical procedures
- ▲ Accepting data with an acknowledged level of uncertainty
- ▲ Recalibrating analytical instruments
- ▲ Qualifying or rejecting the data.

After the implementation of the required corrective action measures, data deemed unacceptable may not be accepted by the PM, and follow-up corrective actions may be explored. The laboratory shall provide details of laboratory corrective actions in the Laboratory Quality Assurance Manual (LQAM).

## **12.0 DATA REDUCTION, VALIDATION, AND REPORTING**

This section of the QAPP discusses the data review process that is required to assure the validity of the data. This process includes a combination of laboratory data reduction and review, independent review and validation, and laboratory reporting procedures that are discussed in the following paragraphs.

All data generated through field activities or by the laboratory operation shall be reduced and validated before reporting. The laboratory shall extensively review all analytical data generated before report generation to verify the validity of the reported data. This internal data review process shall consist of data generation, reduction, a minimum of three levels of documented review, and reporting. In each stage, the review process shall be documented using an appropriate checklist form that is signed and dated by the reviewer. The completed forms shall be maintained in the laboratory project files.

### **12.1 Data Reduction**

#### **12.1.1 Field Data Reduction Procedures**

Field data reduction procedures will be minimal in scope compared to those implemented in the laboratory setting. PCB field test kits and direct-reading instrumentation will be employed in the field. The manufacturer's instructions will be followed for the PCB field test kits, including the use of any formulas or interpretation of results. The use of photoionization detector (PIDs) will generate some measurements directly read from the meter following calibration per manufacturer's recommendations as outlined in the FSP. Data from PCB field test kits and direct-reading instrumentation will be written into field logbooks immediately after measurements are taken. If errors are made, results will be legibly crossed out, initialed, and dated by the field member, and corrected in a space adjacent to the original (erroneous) entry. Later, when the results forms required for this study are being filled out, the CAPE CQCSM or PM will proof the forms to determine whether any transcription errors have been made by the field crew.

Because the use of field instrumentation such as a mobile GC will not be used, there will be no further need for assuring that field data has been reduced properly through the use of formulas or interpretation of raw data printouts.

### **12.1.2 Laboratory Data Reduction Procedures**

For this program, the equations that will be employed in reducing data are those specified in CLP, SW-846, and NIOSH protocols and the applicable laboratory SOP for inorganic and organic analyses. The laboratory data reduction procedures will follow the DODQSM where not addressed in appropriate methodologies. Laboratory data reduction procedures will be followed according to the following protocol: all raw analytical data will be recorded in numerically identified laboratory notebooks. These notebooks will be issued only by the Laboratory QA Manager. Data are recorded in this notebook along with other pertinent information, such as the sample identification number and the sample label number. Other details will also be recorded in the laboratory notebook, such as the analytical method used (SOP number), name of analyst, the date of analysis, matrix sampled, reagent concentrations, instrument settings, and the raw data. Each page of the notebook shall be signed and dated by the analyst. Copies of the strip chart printouts (such as gas chromatograms) will be maintained on file. Periodic review of these notebooks by the Laboratory QA Manager takes place before final data reporting. (Records of notebook entry inspections are maintained by the Laboratory QA Manager.)

Specific data reduction procedures are summarized within the laboratory SOPs along with the persons responsible for each task. These procedures address any statistical approaches used for reducing data, and include applicable units and any term definitions.

In general, data will be reduced in one of the following ways:

- ▲ Manual computation of results directly on the laboratory bench sheet or on calculation pages attached to the data sheets
- ▲ Input of raw data for computer processing
- ▲ Direct acquisition and processing of raw data by a computer.

If data are manually processed by an analyst, all steps in the computation are provided including the equations used and the source of input parameters such as response factors, dilution factors, and calibration constants. If calculations are not performed directly on the data sheet, calculations are done on standard calculation paper and attached to the data sheets.

If data are input and processed using a computer, a copy of the input is kept and uniquely identified with the project number and other information, as needed. The samples analyzed shall be evident and the input signed and dated by the analyst.

If data are directly acquired from instrumentation and processed, the analyst verifies that the following are correct: project and sample numbers, calibration constants and response factors, output parameters such as units, and numerical values used for detection limits (if a value is reported as less than). The analyst signs and dates the resulting output.

### 12.1.3 Laboratory Data Review Procedures

The laboratory's data review process is detailed within the respective laboratory QA plan and is summarized in this section. The analyst who generates the analytical data has the prime responsibility for the correctness and completeness of that data. Each step of the review process involves evaluation of data quality based on both the results of the QC data and the professional judgment of those conducting the review. This application of technical knowledge and experience to the evaluation of data is essential in ensuring that data of quality are generated consistently.

All data generated and reduced shall follow well-documented in-house protocols, including three levels of technical review:

- ▲ Level 1 technical data review, performed by the analyst
- ▲ Level 2 technical review, performed by a supervisor or data review specialist
- ▲ Level 3 administrative data review, performed by the QA Officer or the Program Administrator at the subcontract laboratory.

Laboratory review of analytical data shall be consistent with CLP, SW-846, and NIOSH protocols and applicable laboratory SOPs. One hundred percent of laboratory-generated data will be subjected to internal data review. If matrix interferences are identified during analysis, method modifications such as additional cleanup steps, sample volume changes, and analytical procedure revisions will be attempted and documented. If method modifications do not remedy the problem, alternative procedures will be proposed. The laboratory will assign qualifiers to the data consistent with those described within the U.S. EPA CLP to indicate impacts to data use. At a minimum, the following information will be evaluated by the laboratory, as applicable:

- ▲ Calibration (initial and continuing) and tuning check results
- ▲ Analyte identification and quantification are correct
- ▲ QC samples and method blanks are within control limits
- ▲ Data summaries and reports for transcription and typographical errors
- ▲ Holding times, sample preservation, and sample storage criteria have been met
- ▲ Sample COC documentation for completeness, accuracy, and to ensure sample integrity has been maintained
- ▲ Sample preparation information for completeness and accuracy
- ▲ Documentation (including the case narrative) is complete and correct.

#### **12.1.4 Treatment of Outliers and Nonconforming Data**

Corrective action measures will be taken to resolve problems and restore proper function to any analytical system generating data that indicate that the system is not performing adequately.

Corrective measures may be necessary when the following occurs:

- ▲ QC data are not within control for precision and accuracy
- ▲ Blanks are found with contaminants above acceptable levels
- ▲ Calibration data or instrument performance parameters are not within acceptance criteria
- ▲ Undesirable trends are observed in QC data or calibration data
- ▲ There are sudden changes in instrument sensitivity or performance
- ▲ Deficiencies are identified during audits or from the results of performance evaluation samples.

Initiation of corrective action resulting from the evaluation of QC results will be the responsibility of the Laboratory QA Manager in consultation with the Program Chemist. Corrective action may include, but is not limited to the following:

- ▲ Reanalysis of the samples
- ▲ Documentation of interferences or matrix effects that result in poor analytical performance
- ▲ Evaluating and changing sampling or analytical procedures
- ▲ Resampling and reanalysis, if the completeness or usability of the data set does not meet the criteria for acceptability.

### **12.2 Data Validation**

Data validation procedures shall be performed for both field and laboratory operations as described below.

#### **12.2.1 Procedures Used to Evaluate Field Data**

Procedures to evaluate field data for this program primarily include checking for transcription errors and review of field logbooks, on the part of the field crewmembers. This task will be the responsibility of the CQCSM or Site Manager, who will otherwise not participate in making any of the field measurements, or in adding notes, data, or other information to the logbook.

## **12.2.2 Procedures to Validate Laboratory Data**

Review of the analytical data will be conducted incrementally on each LDP. Analytical results will be thoroughly reviewed before release to the client (CAPE or USACE depending on the point in the review process). There are five steps for review to achieve acceptable data for the purposes of this program. These steps are defined below.

**12.2.2.1 Step 1 - Laboratory Data Review.** The primary laboratory shall review their data before releasing LDPs /reports to CAPE. This step is applicable to all LDPs.

**Process:** The review process shall be as described in Section 12.1.3 of this QAPP.

**Product:** Analytical reports shall contain the analytical results with laboratory QC data. The reports will contain the items described in Section 12.3.2 of this QAPP.

**12.2.2.2 Step 2 - Data Verification.** CAPE shall perform this task for 100 percent of the primary laboratory data. This step is applicable to all LDPs.

**Process:** This is the process of evaluating the completeness, consistency, and compliance of an LDP against the QAPP DQOs. This process requires a definitive data package. CAPE shall extend the data assessment process to include additional data verification. This verification process shall include the following: results of LCS/laboratory control sample duplicate (LCSD), and/or MS/MSD, results of surrogate recoveries, and results of duplicates. The reviewer shall perform verification of 100 percent primary sample results with respect to these QC indicators. The procedure CAPE will use to complete this process is described in Section 12.2.3 of this QAPP.

**Product:** The reviewer shall assign and/or change qualifiers that were assigned by the laboratory to fit their findings, without recalculating the positive hits in the data. This will result in a CDQR that shall include QC nonconformances in summary table(s) format, analytical results, and QC summary tables as submitted by the laboratory.

**12.2.2.3 Step 3 - Data Assurance.** USACE can have QA split samples analyzed at a prescribed laboratory and prepare the Chemical Quality Assurance Report (CQAR). QA splits currently are not planned for this project. The following information is provided in the event QA splits are collected.

**Process:** The intent of data assurance is to provide a complete assessment of the quality of the data by examining primary samples, 10 percent duplicates, and their 10 percent split samples (QA) via comparison of the QA sample results to the duplicate and/or primary sample results. Examination of the primary sample data, and their 10 percent split samples (QA) provides the data user with a degree of the acceptance and usability of the Chemical Data Quality. The findings should be summarized in the CQAR.

**Product:** A detailed description of the CQAR preparation is provided in Chapter 4, EM 200-1-6 (USACE, 1997). The CQAR is a document that is prepared by an independent entity, not involved directly in the analysis of the primary samples, and is the responsibility of the USACE. Note that the verification and validation performed by CAPE in Steps 2 and 4 are intended to fulfill the CQAR requirement for primary laboratory data review. To assure an acceptable quality of primary sample results, the CQAR will normally be divided into

sampling event CQARs over the duration of the project. Any nonconformance with the SAP will be communicated to CAPE, and to the project laboratory for corrective actions. Corrective actions will be implemented to avoid such deficiency in the subsequent phases of analysis. This approach allows in real-time, determination of the laboratory analytical performance, allows determination of data integrity, and data usability. At the end of each project all the CQARs will be assembled into one final CQAR.

**12.2.2.4 Step 4 – Data Validation.** A full data validation will be performed on the excavation confirmation soil samples. Data validation will not be performed on the waste profile samples, decontamination wastewater samples (if there are any), the backfill source samples, or the perimeter air monitoring samples.

**Process:** The data will be validated in accordance with the QC criteria specified in this document and the following documents:

- ▲ U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, EPA-540/R-99-008 (EPA, 1999)
- ▲ U.S. EPA Region 2, 2001. CLP Organic Data Review and Preliminary Review, SOP HW-6, Revision 12, March 2001. (EPA, 2001).

The validator will qualify the data as "U" for levels below the method reporting limit (MRL), "J" for estimated values, and "R" for rejected values.

**Product:** The data validator will prepare a data validation report/Chemical Data Quality Report (CDQR), which will include a summary of contract laboratory's QC analysis results. The summary will consist of a table listing each QC result outside of established criteria. The established criteria will be listed next to the result. QC results within criteria will not be listed. Comments shall be included on how these data affect the validity of analytical results of the samples including data qualifiers used. The flagging will be used to alert data users to uncertainties associated with the data.

### **12.2.3 CAPE Procedures to Verify Laboratory Data (Confirmation Data)**

A Data Evaluation Review (Step 2 of the data assessment process) will be performed by CAPE personnel independent of the laboratory generating the data and will be documented in the CDQR prepared by CAPE upon receipt of the final LDP of each task order. The process will identify any data omissions and out-of-control data points for QC included in the evaluation and interact with the laboratory to correct data deficiencies. Decisions to repeat sample collection and analysis may be made by the PM based on the extent of the deficiencies and their importance in the overall context of the project.

Data evaluations will be based on the QA/QC requirements of the referenced analytical procedures, QC objectives presented in this QAPP, and professional judgment of the evaluator. At a minimum, specific data evaluations shall include evaluation of:

- ▲ Sample receipt records
- ▲ Technical holding times

- ▲ Constituent reporting limits
- ▲ Field and laboratory duplicate RPD results
- ▲ MS/MSD analyses (for organics only)
- ▲ MS/Postdigestion spike analyses (for inorganics only)
- ▲ LCS
- ▲ Blank analyses
- ▲ Surrogate spike analyses (for organics only)
- ▲ Laboratory case narratives
- ▲ Calibration (initial calibration verification (ICV) and continuing calibration verification (CCV)).

The data quality review shall include evaluation of 100 percent of these data. If this review reveals trends of data quality deficiencies or systematic laboratory problems, appropriate additional QC data will be requested (if necessary) from the laboratory for review. Additional laboratory QC data may include initial calibration summaries, calibration check compounds (CCCs), GC/MS tuning checks, internal standard performance, target compound identification and quantitation summaries, sample or standard chromatograms, serial dilutions (used for Inductively Coupled Plasma [ICP] metals only), or others. These data will be evaluated against established method criteria defined in the project DQOs, the functional guidelines, and the approved analytical method. In summary, the CLP contract criteria in the CLP methods will be sufficient for this project.

Data evaluation findings will be documented in the CDQR in terms of analytical representativeness, accuracy, precision, completeness, and sensitivity. Assessment of data comparability is performed by evaluation of QA split sample results (which are not planned for this project) that will not be available during the review, and will be the responsibility of the USACE QA Officer.

**12.2.3.1 Nonconformance of Data.** CAPE will evaluate the above-listed criteria and additional information provided in Section 12.3.2 to determine compliance with the acceptance criteria. In the case that the data do not meet the acceptance criteria, the laboratory will be contacted immediately to determine the source of the failure and determine the need for reanalysis of the sample to meet the criteria. A nonconformance report will be issued at this time, if appropriate. Additional documentation procedures and requirements are outlined in the FSP.

### **12.3 Data Reporting**

Data reporting procedures shall be carried out for field and laboratory operations as indicated below.

### 12.3.1 Field Data Reporting

Field data reporting shall be conducted principally through the transmission of report sheets containing tabulated results of all measurements made in the field, and documentation of all field calibration activities.

### 12.3.2 Laboratory Data Reporting

The laboratory will report the data in a format (CLP or CLP-like) that will allow raw data validation to take place; this report will be a comprehensive data package deliverable. The data package will contain sufficient information to allow complete reconstruction of the analyses that were performed. The raw data required will include laboratory instrument printouts including chromatograms and mass spectra, calibration records, sample preparation records, spiking information, and dilution records. In addition, the laboratory will present reports that will contain enough information for flagging the data according to data qualifier flags, including date prepared, date analyzed, sample results, dilution factors, spike levels and %Rs, calibration summaries, blank results, and laboratory duplicate results. All surrogate recoveries should be reported including recoveries for QC samples and field samples.

These reports shall contain all information and data as required in the applicable CLP SOW and as described below:

- ▲ Case narrative
  - Date of issuance
  - Laboratory report table of contents
  - Project name and number
  - Laboratory analysis performed
  - Any deviations from intended analytical strategy
  - Laboratory batch number
  - Numbers of samples and respective matrices
  - QC procedures used and also references to the acceptance criteria
  - Condition of samples 'as received'
  - Discussion of whether or not sample holding times were met
  - Discussion of technical problems or other observations that may have created analytical difficulties
  - Discussion of laboratory QC checks that failed to meet project criteria
  - Signature of the Laboratory QA Manager
- ▲ Sample custody documentation
  - Original signed COC records
  - Cooler receipt forms
- ▲ Chemistry data package
  - Case narrative for each analyzed batch of samples
  - Summary page indicating dates of analyses for samples and laboratory QC checks
  - Cross referencing of laboratory samples to project sample identification numbers

- Data qualifiers to be used shall be adequately described
  - Sample preparation and analyses methods for samples
  - Sample results
  - MS and MSD recoveries, LCSs, method blank results, and surrogate spike results
  - Dilution factors, collection dates, extraction dates, and analysis dates
  - Laboratory sample spiking levels
- ▲ Calibration data and raw data package
- Results of (dated) initial and continuing calibration checks, and GC/MS tuning results
  - Calibration check compounds and internal standard results
  - Labeled (and dated) chromatograms/spectra of sample results and laboratory QC checks
  - Raw data for sample results and laboratory QC samples.

### 12.3.3 Electronic Data Deliverable

The laboratory will certify that the hard copy reports are identical.

CAPE will submit all analytical data to the USACE. Data deliverables for this service include both hard copy/electronic data reporting forms and supporting raw data, if requested.

The approved laboratory will provide the electronic data deliverable (EDD) processed through the software Staged Electronic Data Deliverable formatted (SEDD). The SEDD system is a data transformation and delivery tool. It uses a Document Object Model (DOM)-based format and industry-standard e-commerce tools that provide end-users with the means to meet data delivery requirements. To use the SEDD system, a laboratory's analytical data must first be stored in an Open Database Connectivity- (ODBC) compliant database. With SEDD's utilities, a data analyst maps current U.S. EPA data requirements to the laboratory's source database. The result of the mapping will be saved in a Data Element Map (DEM) file. After the data is mapped, SEDD converts it into XML (Extensible Markup Language) format, by referencing/using a standardized metadata structure. As an XML file, the analytical data is then ready to be sent via the Internet to the USEPA for further processing. CAPE will convert the EDD in a SEDD parser to a USACE Automatic Data Processing Tool (ADaPT)/Automatic Data Review (ADR) can be used.

The ADaPT tool combines relational database functionality with fully automated data validation. ADaPT includes a comprehensive EDD error-checking tool. The system also provides storage of analytical data, streamlined data access, powerful browse and search tools, and a variety of validation and QC outlier reports. ADaPT uses project specific libraries that allow validation of laboratory data against project criteria. This system was designed by system developers who have broad exposure to data validation, data management, and the environmental chemistry industry.

ADaPT uses a project specific library as the reference for EDD error checking and data review. The project library is an electronic representation of the QAPP. The project library contains all analytes and their data review criteria such as reporting limits, blank contamination rules, holding times, and accuracy and precision criteria for each method and

sample matrix within the scope of a particular project. A project library is created for each different project. In this way, the software has the flexibility to assess EDDs according to a particular project's requirements. The software includes a master library containing a comprehensive list of the most common methods and target analytes. The master library serves as a template for creating project libraries. The software includes a utility for creating project libraries to minimize typing.

#### **12.4 Laboratory Turnaround Time**

The analytical laboratory will provide full deliverables PDF in format on CD and/or electronic results to CAPE. CLP requires the project laboratory must submit final data to CAPE within 14 days, and preliminary data must be submitted within 72 hours after laboratory receipt of each sample in the set. Please refer to Table 1 of the FSP for the required turnaround time requirements. In summary: DESA laboratory must provide a turnaround time of 14 days for the excavation confirmation soil samples and field QC samples results; Kemron Laboratory must provide a turnaround time of 3 days for the waste profile samples results and a turnaround time of 14 days for the backfill samples results; and Princeton Laboratory must provide a turnaround time of 7 days for the perimeter air monitoring results. These data will be used to make operational field decisions. Comprehensive data packages as described in Section 12.3.2. of this QAPP will be submitted to CAPE within 14 working days of sample receipt. It is noted that the DESA laboratory turnaround time may be subject to change based on discussion with the Regional Sample Control Coordinator (RSCC), Jennifer Feranda or Adly Michael.

### **13.0 PREVENTIVE MAINTENANCE**

#### **13.1 Field Instruments**

All equipment used by CAPE will be maintained in accordance with the manufacturer's instructions. Routine maintenance and all equipment repairs will be documented in the site logbook. Whenever a piece of equipment fails to operate properly, the instrument either will be repaired in-house (if possible) or will be sent out for repairs and another instrument equivalent to the original substituted. Preventive maintenance will be scheduled to minimize downtime and the potential interruption of analytical work.

#### **13.2 Analytical Laboratory Instruments**

Preventive maintenance will be routinely performed on each analytical instrument. Preventive maintenance for laboratory instruments is discussed in detail in the laboratory SOPs. Designated laboratory personnel are trained in routine maintenance procedures for all major instrumentation. Trained staff or trained service engineers employed by the instrument manufacturer will perform repairs as necessary. Maintenance contracts will be maintained on all major analytical instruments. All maintenance or repairs conducted will be documented within permanent logbooks, unique to each instrument. These logs will be available for review by auditing personnel. Backup instrumentation will be designated in case of an extended breakdown for a piece of analytical instrumentation. It is the responsibility of the contract laboratory to have a backup plan in force such that all sample holding times can be met. This plan may include subcontracting work to other laboratories

that meet project required accreditations. However, before subcontracting is initiated, approval from CAPE will be obtained, USACE personnel will be informed and approval given, in writing, from the COR, if required.

## **14.0 PERFORMANCE AND SYSTEM AUDITS**

Performance and systems will be audited to verify documentation and implementation of the project work plan, to identify nonconformances, and to verify correction of identified deficiencies.

### **14.1 Assessments and Response Actions**

Assessment activities may include surveillance, inspections, peer review, management system review, readiness review, technical systems audit, performance evaluation, and data quality assessment. The CAPE PM or Program Chemist will be responsible for initiating audits, for selecting the audit team, and for overseeing audit implementation.

The CAPE PM or Program Chemist will evaluate the need for a performance audit independently, or by recommendation of the PM or the client. Performance audits are used to quantitatively assess the accuracy of analytical data through the use of performance evaluation and blind check samples. Laboratory performance will be audited by the PM, Program Chemist, or a designee.

The CHQCSM or Site Manager is responsible for supervising and checking that samples are collected and handled in accordance with the approved project plans and that documentation of work is adequate and complete. The PM is responsible for seeing that project performance satisfies the QA/QC objectives. Reports and technical correspondence will be peer reviewed by an assigned qualified individual, otherwise external to the project, before being finalized.

### **14.2 Field Team Performance and System Audits**

The Site Superintendent or a designated representative will conduct weekly informal audits of the field activities.

The weekly audit for completeness will include the following items:

- ▲ Sample labels
- ▲ COC records
- ▲ Field notebooks
- ▲ Sampling operations
- ▲ Document control.

The first three items above will be checked for completeness. Sampling operations will be reviewed to determine if they are performed as stated in the project-specific work plan, or as directed by the Site Superintendent. The informal document control audit will consist of checking each document for completeness, including such items as signatures, dates, and project numbers.

A systems audit of field operations may be required by the project-specific work plan and will be used to review the total data generation process, which includes onsite review of the field operational system, physical facilities for sampling, and equipment calibrations. A performance audit may be conducted by the PM and the Site Superintendent during the first week of sampling if it is deemed necessary by the PM, Site Superintendent, Program Chemist, or client. The audit may focus on verifying that proper procedures are followed so that subsequent sample data will be valid. Before the audit, a checklist will be prepared by the PM and the Site Superintendent, and will serve as a guide for the performance audit. The audit may verify the following:

- ▲ Collection of samples follows the available written procedures
- ▲ COC procedures are followed for traceability of sample origin
- ▲ Appropriate QC checks are being made in the field and documented in the field logbook
- ▲ Specified equipment is available, calibrated, and in proper working order
- ▲ Sampling crews are adequately trained
- ▲ Recordkeeping procedures are being followed and appropriate documentation is maintained
- ▲ Corrective action procedures are followed.

An audit report summarizing the results and corrections will be prepared and filed in the project files.

#### **14.3 Laboratory Performance and Systems Audits**

The analytical laboratory will conduct both internal and external QC checks. External QC checks include participation in EPA's certification and performance evaluation programs. The results of quarterly performance evaluation samples will be made available to the PM on request. Internal QC checks (duplicates, blanks, and spiked samples) will be performed in accordance with the approved methods.

Laboratory systems will be audited annually and as required by specific projects. Contracted laboratories are required to submit a LQAM and relevant SOPs before the field effort begins. If, during data evaluation and data use, any problems are noted, specific corrective actions will be implemented on a case-by-case basis. An additional systems audit may be requested by the CAPE PM or Program Chemist, if warranted.

Depending on the project objectives, the laboratory may be required to perform the following:

- ▲ Monthly project review of 10 percent of all projects done by the QA department
- ▲ Audits performed by the laboratory QA manager at a frequency greater than specified in the LQAM

- ▲ Special audits by the Program Chemist or corporate management when a problem is suspected.

## **15.0 QUALITY CONTROL REPORTS TO MANAGEMENT**

The purpose of QC reports is to document implementation of the QAPP. These reports include periodic assessments of measurement data accuracy, precision, and completeness; the results of performance audits; the results of system audits; and identification of significant QC problems and recommended solutions.

### **15.1 Daily Chemical Quality Control Reports**

The Daily Chemical Quality Control Report (DCQCR) shall be generated by CAPE's environmental sampler and signed by the CQCSM to assure the chemical data resulting from the site activities meets the contract documentation requirements.

The DCQCR shall contain at a minimum:

- ▲ Contract number and EPA site number
- ▲ Weather, including temperature, wind speed and direction, barometric reading, significant weather changes, etc.
- ▲ Chemical data acquisition work performed, including specific information identifying project and QA samples collected, and calibrations
- ▲ Sampling and sample shipment problems that may affect project DQO requirements
- ▲ Any sampling performed as contingency sampling
- ▲ Corrective actions and/or deviations from the approved SAP
- ▲ Chemical QC activities, as part of the three phase control procedures, that were implemented and confirmation that all deviations or actions jeopardizing project DQOs have been forwarded to project management
- ▲ A summary of the feedback for any corrective action taken
- ▲ Signatures of responsible authority and initials of all persons conducting changes/corrective actions.

### **15.2 Chemical Data Final Report**

After project completion, a Chemical Data Final Report (CDFR) shall be produced by CAPE's Chemical Quality Control Officer (CQCO) and shall include a summary of QC practices employed and all chemical parameter measurement activities. At a minimum the CDFR shall include:

- ▲ Summary of project scope and description

- ▲ Summary of any deviations from the design chemical parameter measurement specifications
- ▲ Summary of chemical parameter measurements performed as contingent measurements
- ▲ Summary discussion of resulting data including achieving data reporting requirements
- ▲ Summary of achieving project-specific DQOs
- ▲ Presentation and evaluation of the data to include an overall assessment on the quality of the data for each method and matrix
- ▲ Internal QC data generated during the project, including tabular summaries correlating sample identifiers with all blank, MS, surrogates, duplicates, LCSs, and batch identifiers
- ▲ A list of affected sample results for each analyte (indexed by method and matrix), including the appropriate data qualifier flag, where sample results are negatively impacted by adverse QC criteria
- ▲ Summary of field and laboratory oversight activities, providing a discussion of the reliability of the data, QC problems encountered and a summary of the evaluation of the data quality for each analysis and matrix as indicated by the laboratory QC data and any other relevant findings
- ▲ Conclusions and recommendations
- ▲ Appendix containing the analytical data package

### 15.3 Chemical Quality Control Summary Report

A Chemical Quality Control Summary Report (CQCSR) shall be produced by CAPE's Program Chemist and approved for release by CAPE's Program Chemist. The CQCSR shall include a summary of all chemical parameter measurement activities after project completion. The CQCSR shall include an evaluation of the achievement of the contract required chemical DQOs. The final CQCSR report will be attached as an appendix to the CDFR. The CQCSR shall contain at a minimum the following elements:

- ▲ Summary of project scope and description of summary of DCQCRs
- ▲ Summary of all deviations from the design chemical parameter measurement specifications
- ▲ Summary of chemical parameter measurements performed as contingent measurements
- ▲ Summary discussion of resulting data including achieving data reporting requirements

- ▲ Summary of achievement of project DQOs
- ▲ Conclusions and recommendations.

Data and data accuracy, precision and completeness will be provided. A final report will be submitted to the USACE after comments from the USACE and any regulatory agencies have been incorporated.

## 16.0 REFERENCES

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## TABLES

**Table 1**

**Environmental Protection Agency, 40 CFR 261.24**  
**MAXIMUM CONCENTRATION OF CONTAMINANTS FOR THE TOXICITY**  
**CHARACTERISTIC**

EPA Haz Waste Number	Contaminant	CAS No.	Regulatory Level (mg/L)	
D004	Arsenic	7440-38-2	5.0	
D005	Barium	7440-39-3	100.0	
D006	Cadmium	7440-43-9	1.0	
D007	Chromium	7440-47-3	5.0	
D008	Lead	7439-92-1	5.0	
D009	Mercury	7439-97-6	0.2	
D010	Selenium	7782-49-2	1.0	
D011	Silver	7440-22-4	5.0	
D012	Endrin	72-20-8	0.02	
D013	Lindane	58-89-9	0.4	
D014	Methoxychlor	72-43-5	10.0	
D015	Toxaphene	8001-35-2	0.5	
D016	2,4-D	94-75-7	10.0	
D017	2,4,5-TP (Silvex)	93-72-1	1.0	
D018	Benzene	71-43-2	0.5	
D019	Carbon tetrachloride	56-23-5	0.5	
D020	Chlordane	57-74-9	0.03	
D021	Chlorobenzene	108-90-7	100.0	
D022	Chloroform	67-66-3	6.0	
D023	o-Cresol	95-48-7	200.0	2
D024	m-Cresol	108-39-4	200.0	2
D025	p-Cresol	106-44-5	200.0	2
D026	Cresol		200.0	2
D027	1,4-Dichlorobenzene	106-46-7	7.5	
D028	1,2-Dichloroethane	107-06-2	0.5	
D029	1,1-Dichloroethylene	75-35-4	0.7	
D030	2,4-Dinitrotoluene	121-14-2	0.13	1
D031	Heptachlor (and its ep-oxide)	76-44-8	0.008	
D032	Hexachlorobenzene	118-74-1	0.13	1
D033	Hexachlorobutadiene	87-68-3	0.5	
D034	Hexachloroethane	67-72-1	3.0	
D035	Methyl ethyl ketone	78-93-3	200.0	

EPA Haz Waste Number	Contaminant	CAS No.	Regulatory Level (mg/L)	
D036	Nitrobenzene	98-95-3	2.0	
D037	Pentachlorophenol	87-86-5	100.0	
D038	Pyridine	110-86-1	5.0	1
D039	Tetrachloroethylene	127-18-4	0.7	
D040	Trichloroethylene	79-01-6	0.5	
D041	2,4,5-Trichlorophenol	95-95-4	400.0	
D042	2,4,6-Trichlorophenol	88-06-2	2.0	
D043	Vinyl chloride	75-01-4	0.2	

1-Quantitation limit is greater than the calculated regulatory level. The quantitation limit therefore becomes the regulatory level.

2-If o-, m-, and p-Cresol concentrations cannot be differentiated, the total cresol (D026) concentration is used. The regulatory level of total cresol is 200 mg/l.

**Table 2**

**Cornell Dubilier Electronics Superfund Site.  
DQO Summary for Soil Excavation Activities**

Step 1 – State the Problem	Step 2 – Identify the Decisions	Step 3 – Identify the Inputs to the Decision	Step 4 – Define Study Boundaries	Step 5 – Develop Decision Rules	Step 6 – Specify Tolerable Limits on Errors	Step 7 – Optimize Sampling Design
In order to remediate CDE properties, the left-in place PCB concentrations must be below 1 ppm (EPA action level). Definitive PCB data will be reported at or below 0.49 ppm.	<ol style="list-style-type: none"> <li>1. Determine/confirm the lateral extent of PCB-impact at each property</li> <li>2. Determine/confirm the vertical extent of PCB-impact at each property</li> <li>3. Determine/confirm if in-place concentrations of PCBs following excavation are acceptable for response complete/NFA</li> </ol>	<ol style="list-style-type: none"> <li>1. <u>Pre-Excavation</u> -Historical Information from Tiers 1 – 3 sampling efforts.</li> <li>2. <u>Pre-Excavation</u> –Use PCB Field-screening measurements to delineate excavation boundaries. Step out in 5'x 5' grid sampling increments at six inch deep intervals, field test kit sample locations will be marked with pin-flags. Is PCBs are detect above 3.0' bgs then sampling will cease. When PCB field test kit is Non-Detect, then split sample will be sent to fixed lab. These split samples will provide definitive data for confirmation.</li> <li>3. <u>Post Excavation</u> – Use PCB Field-screening of excavation base consisting of 5 grab samples composited from a 900 ft<sup>2</sup> area and compositing 5 grab samples from each sidewall of the 900 ft<sup>2</sup> excavation. Confirmation sampling will occur on a 20% frequency to field screening samples to confirm left-in place concentrations.</li> </ol>	<p>Four Properties in OU-1:</p> <ol style="list-style-type: none"> <li>1. <i>Addresser redacted</i></li> <li>2. <i>redacted</i></li> <li>3. <i>redacted</i></li> <li>4. <i>redacted</i></li> </ol>	<ol style="list-style-type: none"> <li>1. Field Screening Data (SDI Immunoassay Sampling Kits for PCBs. The Limit of Quantitation is 0.5 ppm).</li> <li>2. Confirmation Analytical Data (PCBs Organic CLP Method OLM04.3)</li> </ol>	<ol style="list-style-type: none"> <li>1. Over-excavation of 1 ton of soil around a sample point is acceptable (1 ton = 0.67 cy or ~ 5'x5'x1' deep)</li> <li>2. Upper bound of acceptable result is 0.75 ppm using field screening kits. Confirmation samples will be collected at 20% frequency and sent to the fixed-base laboratory (EPA Region 2 DESA) and reported at or below 0.49 ppm. Split samples of the PCB field test kit non-detects (NDs) will be sent to the fixed-base laboratory to determine PCB concentrations are below the 1 ppm EPA cleanup criteria and will be reported at or below 0.49 ppm.</li> <li>3. Lower bound for Non-detect samples is the MDL for the fixed-base laboratory analytical samples</li> </ol>	Using the assumption that the field screening kits can identify PCB levels to 0.5 ppm, the combination of real-time field screening with Fixed-base laboratory analysis will provided response complete/NFA at each study boundary. See example sample design for 109 Arlington.

## FIGURES

**Figure 1**

**SAMPLE RECEIPT FORM**

Date: \_\_\_\_\_ Client: \_\_\_\_\_

Shipped by: ( ) Fed Ex ( ) UPS ( ) DHL ( ) client ( ) laboratory \_\_\_\_\_

Opened by (signature): \_\_\_\_\_

Logged in by (signature): \_\_\_\_\_

IR Temperature Gun Model: \_\_\_\_\_ Calibration Date: \_\_\_\_\_

**Cooler Information**

Number	Cooler ID	Temp°C	Airbill #	COC#	Sample matrix
1					
2					
3					
4					

Were all coolers sealed?	Y	N	N/A
Were Custody seals used on all cooler?	Y	N	N/A
Were custody seal intact?	Y	N	N/A
Was visible ice present?	Y	N	N/A
Were all coolers within the temp range of 2-6 °C?*	Y	N	N/A
Were the samples frozen?*	Y	N	N/A
Were COC papers provided?*	Y	N	N/A
Were all sample containers intact?*	Y	N	N/A
Were all sample labels intact?	Y	N	N/A
Were sample labels legible?*	Y	N	N/A
Did all sample labels match the COC?*	Y	N	N/A
Was the label information complete?*	Y	N	N/A
Were the correct containers used?*	Y	N	N/A
Were the correct preservatives added to the water samples?*	Y	N	N/A
Was the pH tested on preserved water samples?	Y	N	N/A
Was the pH within acceptable ranges?*	Y	N	N/A
Was sufficient amount of sample provided?*	Y	N	N/A
Were bubbles present in the VOA samples?*	Y	N	N/A
Were COCs signed and dated?	Y	N	N/A
Did samples arrive before hold time expired?*	Y	N	N/A
Are discrepancy forms attached?	Y	N	N/A

*All \* require a discrepancy form*

Special instructions:

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## **ATTACHMENT 1**

### **Kemron Project Quality Objectives**

ATTACHMENT 1 - TABLE 1

Project Quality Control Objectives for Soil and Groundwater Samples

		Method Detection Limits		Minimum PQL		Accuracy Limits		Precision Limits		Accuracy Limits		Precision Limits	
						MS/MSD Recoveries		MS/MSD Deviation		LCS Recoveries		Field Dup Deviation	
Method No <sup>1</sup>	Analyte / Component	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>
VOLATILES BY GC/MS		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%
8260B <sup>3</sup>	1,1,2-Tetrachloroethane	0.25	0.5	5	5	80-130	71-137	< 25	< 40	80-130	71-137	< 25	< 40
8260B	1,1,1-Trichloroethane	0.25	0.5	5	5	80-13	68-133	< 28	< 40	80-134	68-133	< 28	< 40
8260B	1,1,2,2-Tetrachloroethane	0.125	0.5	5	5	79-125	62-132	< 28	< 43	79-125	62-132	< 28	< 43
8260B	1,1,2-Trichloroethane	0.25	0.5	5	5	80-125	67-129	< 20	< 38	80-125	67-129	< 20	< 38
8260B	1,1-Dichloroethane	0.125	1	5	5	80-125	73-130	< 21	< 32	80-125	73-130	< 21	< 32
8260B	1,1-Dichloroethene	0.5	0.5	5	5	80-125	61-133	< 26	< 44	80-132	61-133	< 26	< 44
8260B	1,1-Dichloropropene	0.25	0.5	5	5	74-139	57-138	< 40	< 49	74-139	57-138	< 40	< 49
8260B	1,2,3-Trichlorobenzene	0.125	0.5	5	5	62-140	52-142	< 48	< 55	62-140	52-142	< 48	< 55
8260B	1,2,3-Trichloropropane	0.75	0.64	5	5	80-126	64-134	< 25	< 43	80-126	64-134	< 25	< 43
8260B	2-Chlorotoluene	0.125	0.5	5	5	80-127	63-147	< 28	< 52	80-127	63-147	< 28	< 52
8260B	2-Chloroethyl vinyl ether	2	0.5	10	10	10-211	10-239	< 125	< 152	10-211	10-239	< 125	< 152
8260B	2-Butanone	2.5	2.5	100	100	58-149	37-172	< 56	< 82	58-149	37-172	< 56	< 82
8260B	2,2-Dichloropropane	0.25	0.5	5	5	80-133	66-135	< 29	< 42	80-133	66-135	< 29	< 42
8260B	1,4-Dichlorobenzene	0.125	0.5	5	5	80-120	70-130	< 15	< 28	80-120	70-130	< 15	< 28
8260B	1,3-Dichloropropane	0.2	0.5	5	5	80-120	65-128	< 20	< 38	80-120	65-128	< 20	< 38
8260B	1,3-Dichlorobenzene	0.25	0.5	5	5	80-120	70-130	< 16	< 29	80-120	70-130	< 16	< 29
8260B	1,3,5-Trimethylbenzene	0.25	0.5	5	5	80-127	74-133	< 25	< 36	80-127	74-133	< 25	< 36
8260B	1,2-Dichloropropane	0.125	0.5	5	5	80-120	70-130	< 20	< 31	80-120	70-130	< 20	< 31
8260B	cis-1,2-Dichloroethene	0.25	0.5	5	5	80-121	70-130	< 19	< 30	80-121	70-130	< 19	< 30
8260B	Chloromethane	0.25	2	10	10	60-130	30-131	< 43	< 62	60-130	30-131	< 43	< 62
8260B	Chloroform	0.125	0.5	5	5	80-125	74-129	< 23	< 33	80-125	74-129	< 23	< 33
8260B	Chloroethane	0.5	1	10	10	77-133	52-135	< 34	< 51	77-133	52-135	< 34	< 51
8260B	Chlorobenzene	0.125	0.5	5	5	80-120	70-130	< 16	< 28	80-120	70-130	< 16	< 28
8260B	Carbon tetrachloride	0.25	0.5	5	5	80-137	59-136	< 32	< 47	80-137	59-136	< 32	< 47
8260B	Carbon disulfide	0.5	0.5	5	5	58-138	39-139	< 49	< 61	58-138	39-139	< 49	< 61
8260B	Bromomethane	0.5	1	10	10	61-151	37-143	< 56	< 64	61-151	37-143	< 56	< 64
8260B	Bromoform	0.54	0.5	5	5	74-130	49-136	< 35	< 53	74-130	49-136	< 35	< 53
8260B	tert-Butylbenzene	0.25	0.5	5	5	80-126	72-130	< 27	< 36	80-126	72-130	< 27	< 36
8260B	Styrene	0.125	0.5	5	5	80-123	74-130	< 20	< 35	80-123	74-130	< 20	< 35
8260B	sec-Butylbenzene	0.25	0.5	5	5	80-127	71-132	< 28	< 38	80-127	71-132	< 28	< 38
8260B	p-Isopropyltoluene	0.25	0.5	5	5	80-122	72-128	< 24	< 34	80-122	72-128	< 24	< 34
8260B	o-Xylene	0.25	0.5	5	5	80-122	70-130	< 18	< 31	80-122	70-130	< 18	< 31
8260B	Naphthalene	0.2	0.5	10	10	59-149	50-146	< 55	< 59	59-149	50-146	< 55	< 59
8260B	n-Propylbenzene	0.125	0.5	5	5	80-129	72-146	< 27	< 39	80-129	72-146	< 27	< 39
8260B	n-Butylbenzene	0.25	0.5	5	5	80-131	70-136	< 29	< 37	80-131	70-136	< 29	< 37
8260B	Methylene chloride	0.25	1	5	5	80-123	74-128	< 22	< 33	80-123	74-128	< 22	< 33
8260B	Vinyl chloride	0.25	1	10	10	65-140	25-130	< 46	< 60	65-140	25-130	< 46	< 60
8260B	Vinyl acetate	2.5	1	10	10	10-200	25-200	< 50	< 50	10-200	25-200	< 50	< 50
8260B	Trichlorofluoromethane	0.25	1	10	10	62-151	48-154	< 55	< 65	62-151	48-154	< 55	< 65

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Project Quality Control Objectives for Soil and Groundwater Samples

Method No <sup>1</sup>	Analyte / Component	Method Detection Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation	
		Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>
8260B	Trichloroethene	0.25	0.5	5	5	80-122	72-126	< 21	< 33	80-122	72-126	< 21	< 33
8260B	trans-1,3-Dichloropropene	0.5	0.5	5	5	80-130	65-139	< 25	< 45	80-130	65-139	< 25	< 45
8260B	trans-1,2-Dichloroethene	0.25	0.5	5	5	80-127	72-127	< 24	< 34	80-127	72-127	< 24	< 34
8260B	Toluene	0.25	0.5	5	5	80-124	77-126	< 22	< 29	80-124	77-126	< 22	< 29
8260B	Tetrachloroethene	0.25	0.5	5	5	80-124	72-130	< 22	< 32	80-124	72-130	< 22	< 32
8260B	m-p-Xylene	0.5	0.5	5	5	80-122	70-130	< 21	< 30	80-122	70-130	< 21	< 30
8260B	Isopropylbenzene	0.25	0.5	5	5	80-122	68-129	< 24	< 38	80-122	68-129	< 24	< 38
8260B	Hexachlorobutadiene	0.25	0.5	5	5	72-132	65-135	< 36	< 43	72-132	65-135	< 36	< 43
8260B	Ethylbenzene	0.25	0.5	5	5	80-122	70-130	< 20	< 29	80-122	70-130	< 20	< 29
8260B	Dichlorodifluoromethane	0.25	1	10	10	50-133	25-130	< 51	< 84	50-133	25-130	< 51	< 84
8260B	Dibromomethane	0.25	0.5	5	5	80-126	69-130	< 24	< 38	80-126	69-130	< 24	< 38
8260B	Chlorodibromomethane	0.25	0.5	5	5	80-127	59-136	< 26	< 47	80-127	59-136	< 26	< 47
8260B	cis-1-3-Dichloropropene	0.25	0.5	5	5	80-132	70-142	< 26	< 44	80-132	70-142	< 26	< 44
8260B	Bromodichloromethane	0.25	0.5	5	5	80-131	72-127	< 25	< 40	80-131	72-127	< 25	< 40
8260B	Bromochloromethane	0.2	0.5	5	5	80-124	70-130	< 20	< 30	80-124	70-130	< 20	< 30
8260B	Bromobenzene	0.125	0.5	5	5	80-120	72-131	< 18	< 36	80-120	72-131	< 18	< 36
8260B	Benzene	0.125	0.5	5	5	80-121	70-139	< 21	< 29	80-121	70-139	< 21	< 29
8260B	Acetone	2.5	5	100	100	40-142	20-176	< 63	< 96	40-142	20-176	< 63	< 96
8260B	4-Methyl-2-pentanone	2.5	2.5	10	10	64-140	47-146	< 47	< 61	64-140	47-146	< 47	< 61
8260B	4-Chlorotoluene	0.25	0.5	5	5	80-126	70-138	< 26	< 42	80-126	70-138	< 26	< 42
8260B	2-Hexanone	2.5	2.5	10	10	56-136	39-139	< 49	< 62	56-136	39-139	< 49	< 62
8260B	1,2,4-Trichlorobenzene	0.2	0.5	5	5	77-131	71-133	< 33	< 38	77-131	71-133	< 33	< 38
8260B	1,2,4-Trimethylbenzene	0.25	0.5	5	5	80-125	75-132	< 26	< 35	80-125	75-132	< 26	< 35
8260B	1,2-Dibromo-3-chloropropane	1	1	5	5	65-129	49-127	< 39	< 48	65-129	49-127	< 39	< 48
8260B	1,2-Dibromoethane	0.25	0.5	5	5	80-125	69-128	< 20	< 36	80-125	69-128	< 20	< 36
8260B	1,2-Dichlorobenzene	0.125	0.5	5	5	80-125	70-130	< 15	< 29	80-125	70-130	< 15	< 29
8260B	1,2-Dichloroethane	0.25	0.5	5	5	80-129	63-133	< 29	< 43	80-129	63-133	< 29	< 43
8260B	1,2-Dichloroethane-d4	N/A	N/A	N/A	N/A	80-120	80-120	N/A	N/A	80-120	80-120	N/A	N/A
8260B	4-Bromofluorobenzene	N/A	N/A	N/A	N/A	86-115	74-121	N/A	N/A	86-115	74-121	N/A	N/A
8260B	Toluene-d8	N/A	N/A	N/A	N/A	88-110	81-117	N/A	N/A	88-110	81-117	N/A	N/A
8260B	Dibromofluoromethane	N/A	N/A	N/A	N/A	86-118	80-120	N/A	N/A	86-118	80-120	N/A	N/A
<b>VOLATILES BY GC</b>		<b>ug/L</b>	<b>ug/kg</b>	<b>ug/L</b>	<b>ug/kg</b>	<b>%</b>	<b>%</b>	<b>%</b>	<b>%</b>	<b>%</b>	<b>%</b>	<b>%</b>	<b>%</b>
8021B	1,2-Dichlorobenzene	0.5	0.41	1	5	79-124	44-159	< 28	< 70	79-124	44-159	< 28	< 70
8021B	1,3-Dichlorobenzene	0.5	0.4	1	5	76-127	49-139	< 31	< 56	76-127	49-139	< 31	< 56
8021B	1,4-Dichlorobenzene	0.5	0.35	1	5	78-126	41-155	< 29	< 70	78-126	41-155	< 29	< 70
8021B	Chlorobenzene	0.5	0.35	0.5	5	80-121	80-122	< 24	< 26	80-121	80-122	< 24	< 26
8021B	Toluene	0.5	0.72	1	5	80-124	80-121	< 26	< 24	80-124	80-121	< 26	< 24

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Project Quality Control Objectives for Soil and Groundwater Samples

Method No <sup>1</sup>	Analyte / Component	Method Detection Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation	
		Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>
8021B	Xylenes Total	0.5	1.07	1	5	80-121	80-120	< 24	< 23	80-121	80-120	< 24	< 23
8021B	Ethylbenzene	0.5	0.35	1	5	80-125	80-124	< 25	< 26	80-125	80-124	< 25	< 26
8021B	Benzene	0.5	0.32	1	5	80-122	80-120	< 24	< 24	80-122	80-120	< 24	< 24
8021B	a,a,a-Trifluorotoluene	N/A	N/A	N/A	N/A	70-130	47-121	N/A	N/A	70-130	47-121	N/A	N/A
<b>EDB &amp; DBCP BY GC</b>		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%
8011	1,2-Ethylene Dibromide	0.003	NA	0.01	NA	85-115	NA	< 20	NA	85-115	NA	< 20	NA
8011	1,2-Dibromo-3-chloropropane	0.003	NA	0.04	NA	85-115	NA	< 20	NA	85-115	NA	< 20	NA
List Surrogates													

**ATTACHMENT 1 - TABLE 1**

Project Quality Control Objectives for Soil and Groundwater Samples

		Method Detection Limits		Minimum PQL		Accuracy Limits		Precision Limits		Accuracy Limits		Precision Limits	
Method No <sup>1</sup>	Analyte / Component	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	MS/MSD Recoveries		MS/MSD Deviation		LCS Recoveries		Field Dup Deviation	
		ug/L	ug/kg	ug/L	ug/kg	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>
SEMI-VOLATILES BY GC/MS						%	%	%	%	%	%	%	%
8270C	1,2,4-Trichlorobenzene	2.5	82.5	5	165	26-72	13-88	< 42	< 46	26-72	13-88	< 42	< 46
8270C	1,2-Dichlorobenzene	2.5	82.5	5	165	25-66	16-85	< 39	< 42	25-66	16-85	< 39	< 42
8270C	1,3-Dichlorobenzene	2.5	82.5	5	165	24-62	16-84	< 40	< 42	24-62	16-84	< 40	< 42
8270C	1,4-Dichlorobenzene	2.5	82.5	5	165	24-62	13-84	< 37	< 43	24-62	13-84	< 37	< 43
8270C	2,4-Dichlorophenol	2.5	82.5	5	165	15-90	14-100	< 59	< 53	15-90	14-100	< 59	< 53
8270C	2,4-Dinitrophenol	12.5	330	25	825	20-118	11-127	< 67	< 72	20-118	11-127	< 67	< 72
8270C	2,6-Dinitrotoluene	2.5	82.5	5	165	28-112	14-126	< 56	< 69	28-112	14-126	< 56	< 69
8270C	2-Chlorophenol	2.5	82.5	5	165	15-78	13-90	< 51	< 47	15-78	13-90	< 51	< 47
8270C	2-Chloronaphthalene	2.5	82.5	5	165	34-95	15-96	< 48	< 50	34-95	15-96	< 48	< 50
8270C	4-Bromophenyl-phenylether	2.5	82.5	5	165	42-101	17-112	< 48	< 58	42-101	17-112	< 48	< 58
8270C	4,6-Dinitro-2-methylphenol	12.5	330	25	825	30-125	11-152	< 70	< 86	30-125	11-152	< 70	< 86
8270C	3-Nitroaniline	12.5	330	25	825	10-121	13-153	< 115	< 86	10-121	13-153	< 115	< 86
8270C	3,4-Methylphenol	2.5	82.5	5	165	10-90	25-135	< 35	< 52	10-90	25-135	< 35	< 52
8270C	3,3'-Dichlorobenzidine	2.5	165	10	330	15-142	10-209	< 119	< 135	15-142	10-209	< 119	< 135
8270C	2-Nitrophenol	2.5	82.5	5	165	19-86	10-102	< 55	< 60	19-86	10-102	< 55	< 60
8270C	2-Nitroaniline	12.5	330	25	825	21-101	15-123	< 52	< 67	21-101	15-123	< 52	< 67
8270C	2-Methylphenol	2.5	82.5	5	165	15-86	13-99	< 50	< 52	15-86	13-99	< 50	< 52
8270C	2-Methylnaphthalene	2.5	82.5	5	165	27-77	10-103	< 49	< 49	27-77	10-103	< 49	< 49
8270C	Bis(2-Chloroethyl)ether	2.5	82.5	5	165	30-77	10-93	< 45	< 52	30-77	10-93	< 45	< 52
8270C	Bis(2-Chloroethoxy)Methane	2.5	82.5	5	165	30-79	12-99	< 55	< 53	30-79	12-99	< 55	< 53
8270C	Benzyl alcohol	2.5	82.5	5	165	23-84	13-96	< 49	< 51	23-84	13-96	< 49	< 51
8270C	Benzoic acid	12.5	330	25	825	10-150	10-95	< 259	< 61	10-150	10-95	< 259	< 61
8270C	Benzo(k)fluoranthene	2.5	82.5	5	165	62-124	10-165	< 60	< 79	62-124	10-165	< 60	< 79
8270C	Benzo(g,h,i)perylene	2.5	82.5	5	165	59-124	10-160	< 88	< 85	59-124	10-160	< 88	< 85
8270C	Benzo(b)fluoranthene	2.5	82.5	5	165	63-123	10-161	< 60	< 76	63-123	10-161	< 60	< 76
8270C	Benzo(a)pyrene	2.5	82.5	5	165	63-124	10-152	< 62	< 72	63-124	10-152	< 62	< 72
8270C	Benzo(a)anthracene	2.5	82.5	5	165	54-124	10-159	< 55	< 83	54-124	10-159	< 55	< 83
8270C	Indeno(1,2,3-cd)pyrene	2.5	82.5	5	165	58-123	10-162	< 83	< 84	58-123	10-162	< 83	< 84
8270C	Hexachloroethane	2.5	82.5	5	165	21-90	10-87	< 47	< 47	21-90	10-87	< 47	< 47
8270C	Hexachlorocyclopentadiene	2.5	82.5	5	165	10-78	10-92	< 47	< 60	10-78	10-92	< 47	< 60
8270C	Hexachlorobutadiene	2.5	82.5	5	165	27-76	15-100	< 59	< 52	27-76	15-100	< 59	< 52
8270C	Hexachlorobenzene	2.5	82.5	5	165	50-121	25-136	< 55	< 68	50-121	25-136	< 55	< 68
8270C	Fluorene	2.5	82.5	5	165	40-104	10-122	< 59	< 55	40-104	10-122	< 59	< 55
8270C	Fluoranthene	2.5	82.5	5	165	63-128	10-158	< 68	< 80	63-128	10-158	< 68	< 80
8270C	Dimethylphthalate	2.5	82.5	5	165	27-107	20-122	< 57	< 63	27-107	20-122	< 57	< 63
8270C	Diethylphthalate	2.5	82.5	5	165	35-125	26-140	< 59	< 70	35-125	26-140	< 59	< 70
8270C	Pyrene	2.5	82.5	5	165	54-130	10-161	< 53	< 89	54-130	10-161	< 53	< 89
8270C	Phenol	2.5	82.5	5	165	10-84	13-95	< 21	< 51	10-84	13-95	< 21	< 51
8270C	Phenanthrene	2.5	82.5	5	165	58-120	10-144	< 59	< 70	58-120	10-144	< 59	< 70

ATTACHMENT 1 - TABLE 1

Project Quality Control Objectives for Soil and Groundwater Samples

Method No <sup>1</sup>	Analyte / Component	Method Detection Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation	
		Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>
8270C	Pentachlorophenol	12.5	330	25	825	30-124	21-146	< 60	< 77	30-124	21-146	< 60	< 77
8270C	Nitrobenzene	2.5	82.5	5	165	20-78	12-93	< 45	< 50	20-78	12-93	< 45	< 50
8270C	Naphthalene	2.5	82.5	5	165	25-76	10-95	< 45	< 45	25-76	10-95	< 45	< 45
8270C	N-Nitrosodipropylamine	2.5	82.5	5	165	34-86	10-103	< 51	< 59	34-86	10-103	< 51	< 59
8270C	N-Nitrosodiphenylamine	2.5	82.5	5	165	43-122	21-127	< 57	< 65	43-122	21-127	< 57	< 65
8270C	Isophorone	2.5	82.5	5	165	20-99	13-114	< 71	< 62	20-99	13-114	< 71	< 62
8270C	Dibenzofuran	2.5	82.5	5	165	33-94	18-108	< 54	< 55	33-94	18-108	< 54	< 55
8270C	Dibenzo(a,h)Anthracene	2.5	82.5	5	165	55-130	10-169	< 86	< 88	55-130	10-169	< 86	< 88
8270C	Di-n-octylphthalate	2.5	82.5	5	165	66-138	17-173	< 64	< 96	66-138	17-173	< 64	< 96
8270C	Di-N-Butylphthalate	2.5	82.5	5	165	65-133	22-156	< 61	< 82	65-133	22-156	< 61	< 82
8270C	Chrysene	2.5	82.5	5	165	55-124	10-153	< 55	< 72	55-124	10-153	< 55	< 72
8270C	Butylbenzylphthalate	2.5	82.5	5	165	51-147	22-162	< 62	< 86	51-147	22-162	< 62	< 86
8270C	bis(2-Ethylhexyl)phthalate	2.5	82.5	5	165	54-140	22-157	< 57	< 83	54-140	22-157	< 57	< 83
8270C	bis(2-Chloroisopropyl)ether	2.5	82.5	5	165	24-80	10-84	< 44	< 49	24-80	10-84	< 44	< 49
8270C	Anthracene	2.5	82.5	5	165	59-118	10-149	< 65	< 72	59-118	10-149	< 65	< 72
8270C	Acenaphthylene	2.5	82.5	5	165	31-96	10-109	< 55	< 53	31-96	10-109	< 55	< 53
8270C	Acenaphthene	2.5	82.5	5	165	30-92	10-123	< 51	< 70	30-92	10-123	< 51	< 70
8270C	4-Nitrophenol	12.5	330	25	825	10-139	10-165	< 29	< 99	10-139	10-165	< 29	< 99
8270C	4-Nitroaniline	12.5	330	25	825	40-136	14-169	< 95	< 95	40-136	14-169	< 95	< 95
8270C	4-Chlorophenyl-phenyl ether	2.5	82.5	5	165	38-101	14-119	< 55	< 64	38-101	14-119	< 55	< 64
8270C	4-Chloroaniline	2.5	82.5	5	165	20-85	10-110	< 70	< 73	20-85	10-110	< 70	< 73
8270C	4-Chloro-3-methylphenol	2.5	82.5	5	165	20-113	14-116	< 66	< 62	20-113	14-116	< 66	< 62
8270C	2,4-Dinitrotoluene	2.5	82.5	5	165	36-126	24-146	< 56	< 75	36-126	24-146	< 56	< 75
8270C	2,4-Dimethylphenol	2.5	82.5	5	165	20-93	14-107	< 58	< 57	20-93	14-107	< 58	< 57
8270C	2,4,6-Trichlorophenol	2.5	82.5	5	165	20-103	12-114	< 60	< 63	20-103	12-114	< 60	< 63
8270C	2,4,5-Trichlorophenol	2.5	82.5	5	165	20-116	13-116	< 62	< 63	20-116	13-116	< 62	< 63
8270C	2,4,6-Tribromophenol	N/A	N/A	N/A	N/A	10-123	19-122	N/A	N/A	10-123	19-122	N/A	N/A
8270C	Phenol-d5	N/A	N/A	N/A	N/A	10-94	24-113	N/A	N/A	10-94	24-113	N/A	N/A
8270C	2-Fluorobiphenyl	N/A	N/A	N/A	N/A	43-116	30-115	N/A	N/A	43-116	30-115	N/A	N/A
8270C	Nitrobenzene-d5	N/A	N/A	N/A	N/A	35-114	23-120	N/A	N/A	35-114	23-120	N/A	N/A
8270C	p-Terphenyl-d14	N/A	N/A	N/A	N/A	33-141	18-137	N/A	N/A	33-141	18-137	N/A	N/A
8270C	2-Fluorophenol	N/A	N/A	N/A	N/A	21-100	25-121	N/A	N/A	21-100	25-121	N/A	N/A

**ATTACHMENT 1 - TABLE 1**

Project Quality Control Objectives for Soil and Groundwater Samples

		Method Detection Limits		Minimum PQL		Accuracy Limits		Precision Limits		Accuracy Limits		Precision Limits	
						MS/MSD Recoveries		MS/MSD Deviation		LCS Recoveries		Field Dup Deviation	
Method No <sup>1</sup>	Analyte / Component	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>
PAHs BY HPLC		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%
8310	1-Methylnaphthalene	0.5	16.7	1	165	26-71	26-94	< 50	<40	26-71	26-94	< 50	<40
8310	2-Methylnaphthalene	0.5	16.7	1	165	26-72	26-94	< 50	<40	26-72	26-94	< 50	<40
8310	Acenaphthene	0.5	16.7	1	165	25-78	24-100	< 50	<40	25-78	24-100	< 50	<40
8310	Acenaphthylene	0.5	16.7	1	165	25-77	26-94	< 50	<40	25-77	26-94	< 50	<40
8310	Anthracene	0.5	16.7	1	165	47-101	40-92	< 50	<40	47-101	40-92	< 50	<40
8310	Benzo(a)anthracene	0.1	1.67	0.2	16.5	50-115	60-107	< 50	<40	50-115	60-107	< 50	<40
8310	Benzo(a)pyrene	0.1	1.67	0.2	16.5	29-113	51-101	< 50	<40	29-113	51-101	< 50	<40
8310	Benzo(b)fluoranthene	0.1	1.67	0.2	16.5	41-110	61-108	< 50	<40	41-110	61-108	< 50	<40
8310	Benzo(g,h,i)perylene	0.1	1.67	0.2	16.5	11-84	53-118	< 50	<40	11-84	53-118	< 50	<40
8310	Pyrene	0.1	1.67	0.2	16.5	56-104	50-108	< 50	<40	56-104	50-108	< 50	<40
8310	Phenanthrene	0.5	16.7	1	165	39-95	38-102	< 50	<40	39-95	38-102	< 50	<40
8310	Benzo(k)fluoranthene	0.1	1.67	0.2	16.5	25-107	59-112	< 50	<40	25-107	59-112	< 50	<40
8310	Chrysene	0.1	1.67	0.2	16.5	39-95	60-104	< 50	<40	39-95	60-104	< 50	<40
8310	Dibenzo(a,h)anthracene	0.1	1.67	0.2	16.5	Oct-92	58-113	< 50	<40	Oct-92	58-113	< 50	<40
8310	Fluoranthene	0.1	1.67	0.2	16.5	55-104	54-105	< 50	<40	55-104	54-105	< 50	<40
8310	Fluorene	0.5	16.7	1	165	29-84	28-98	< 50	<40	29-84	28-98	< 50	<40
8310	Indeno(1,2,3-cd)pyrene	0.1	1.67	0.2	16.5	16-98	58-105	< 50	<40	16-98	58-105	< 50	<40
8310	Naphthalene	0.5	16.7	1	165	25-68	22-85	< 50	<40	25-68	22-85	< 50	<40
8310	p-terphenyl-d14	N/A	NA	N/A	NA	15-125	50-150	N/A	NA	15-125	50-150	N/A	NA
Organochlorine Pesticides BY GC		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%
8081A	4,4'-DDD	0.025	0.825	0.1	3.3	50-145	47-151	< 40	< 40	50-145	47-151	< 40	< 40
8081A	4,4'-DDE	0.025	0.825	0.1	3.3	50-145	46-151	< 40	< 40	50-145	46-151	< 40	< 40
8081A	4,4'-DDT	0.025	0.825	0.1	3.3	45-140	33-175	< 40	< 40	45-140	33-175	< 40	< 40
8081A	alpha-BHC	0.01	0.4	0.05	1.65	37-130	35-145	< 40	< 40	37-130	35-145	< 40	< 40
8081A	beta-BHC	0.01	0.4	0.05	1.65	61-131	44-139	< 40	< 40	61-131	44-139	< 40	< 40
8081A	delta-BHC	0.01	0.4	0.05	1.65	47-140	43-146	< 40	< 40	47-140	43-146	< 40	< 40
8081A	Endosulfan I	0.01	0.4	0.05	1.65	50-130	29-140	< 40	< 40	50-130	29-140	< 40	< 40
8081A	Endosulfan sulfate	0.025	0.825	0.1	3.3	30-130	16-148	< 40	< 40	30-130	16-148	< 40	< 40
8081A	Endrin aldehyde	0.025	0.825	0.1	3.3	30-130	11-118	< 40	< 40	30-130	11-118	< 40	< 40
8081A	Toxaphene	0.5	16.7	1	33	41-126	25-138	< 40	< 40	41-126	25-138	< 40	< 40
8081A	Methoxychlor	0.025	0.825	0.5	16.5	60-150	51-156	< 40	< 40	60-150	51-156	< 40	< 40
8081A	Heptachlor epoxide	0.01	0.4	0.05	1.65	60-132	46-143	< 40	< 40	60-132	46-143	< 40	< 40
8081A	Heptachlor	0.01	0.4	0.05	1.65	40-130	33-150	< 40	< 40	40-130	33-150	< 40	< 40
8081A	gamma Chlordane	0.01	0.4	0.05	1.65	60-135	46-145	< 40	< 40	60-135	46-145	< 40	< 40
8081A	gamma-BHC (Lindane)	0.01	0.4	0.05	1.65	43-122	39-145	< 40	< 40	43-122	39-145	< 40	< 40

**ATTACHMENT 1 - TABLE 1**

Project Quality Control Objectives for Soil and Groundwater Samples

Method No <sup>1</sup>	Analyte / Component	Method Detection Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation	
		Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>
8081A	Endrin ketone	0.025	0.825	0.1	3.3	31-141	30-144	< 40	< 40	31-141	30-144	< 40	< 40
8081A	Endrin	0.025	0.825	0.1	3.3	50-150	24-185	< 40	< 40	50-150	24-185	< 40	< 40
8081A	Endosulfan II	0.025	0.825	0.1	3.3	30-130	29-132	< 40	< 40	30-130	29-132	< 40	< 40
8081A	Dieldrin	0.025	0.825	0.1	3.3	60-150	50-147	< 40	< 40	60-150	50-147	< 40	< 40
8081A	alpha Chlordane	0.01	0.4	0.05	1.65	60-135	38-154	< 40	< 40	60-135	38-154	< 40	< 40
8081A	Aldrin	0.01	0.4	0.05	1.65	38-130	27-148	< 40	< 40	38-130	27-148	< 40	< 40
8081A	2,4,5,6-Tetrachloro-m-xylene	N/A	NA	N/A	NA	20-180	39-130	N/A	<40	20-180	39-130	N/A	<40
8081A	Decachlorobiphenyl	N/A	N/A	N/A	N/A	25-140	33-143	N/A	N/A	25-140	33-143	N/A	N/A
<b>Organophosphorus Pesticides BY GC</b>		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%
8141A	Aspon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
List Additional Compounds and Surrogates													
<b>Polychlorinated Biphenyls (PCBs) BY GC</b>		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%
8082	Aroclor-1016	0.25	8.25	0.5	16.5	32-137	64-136	< 40	< 40	32-137	64-136	< 40	< 40
8082	Aroclor-1221	0.25	8.25	0.5	16.5	NS-NS	NS-NS	< N/A	< N/A	NS-NS	NS-NS	< N/A	< N/A
8082	Aroclor-1242	0.25	8.25	0.5	16.5	NS-NS	NS-NS	< N/A	< N/A	NS-NS	NS-NS	< N/A	< N/A
8082	Aroclor-1232	0.25	8.25	0.5	16.5	NS-NS	NS-NS	< N/A	< N/A	NS-NS	NS-NS	< N/A	< N/A
8082	Aroclor-1248	0.25	8.25	0.5	16.5	NS-NS	63-137	< N/A	< 40	NS-NS	63-137	< N/A	< 40
8082	Aroclor-1260	0.25	8.25	0.5	16.5	37-149	NS-NS	< 40	< N/A	37-149	NS-NS	< 40	< N/A
8082	Aroclor-1254	0.25	8.25	0.5	16.5	NS-NS	NS-NS	< N/A	< N/A	NS-NS	NS-NS	< N/A	< N/A
8082	Decachlorobiphenyl	N/A	N/A	N/A	N/A	25-140	30-173	N/A	N/A	25-140	30-173	N/A	N/A
8082	2,4,5,6-Tetrachloro-m-xylene	N/A	N/A	N/A	N/A	20-180	29-133	N/A	N/A	20-180	29-133	N/A	N/A
<b>Chlorinated Herbicides BY GC</b>		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%
8151A	2,4,5-T	0.1	2	0.2	4	24-133	20-144	< 44	< 50	24-133	20-144	< 44	< 50
8151A	2,4,5-TP(Silvex)	0.1	1.5	0.2	3	38-130	31-132	< 44	< 50	38-130	31-132	< 44	< 50
8151A	2,4-D	1	20	2	40	29-133	32-132	< 51	< 50	29-133	32-132	< 51	< 50
8151A	Dinoseb	0.5	10	1	20	28-92	15-100	< 73	< 50	28-92	15-100	< 73	< 50
8151A	Dicamba	0.1	2	0.2	4	43-129	33-146	< 46	< 50	43-129	33-146	< 46	< 50
8151A	MCPA	100	2000	250	4000	26-114	19-147	< 47	< 50	26-114	19-147	< 47	< 50
8151A	Pentachlorophenol	0.1	2	0.2	4	38-130	31-132	< N/A	< 50	38-130	31-132	< N/A	< 50
8151A	MCPP	100	2000	250	4000	32-119	10-219	< 44	< 50	32-119	10-219	< 44	< 50
8151A	Dichloroprop	1	20	2	40	42-118	35-139	< 36	< 50	42-118	35-139	< 36	< 50
8151A	Dalapon	2.5	50	5	100	13-101	10-99	< 23	< 50	13-101	10-99	< 23	< 50
8151A	2,4-DB	1	20	2	40	29-123	29-134	< 52	< 50	29-123	29-134	< 52	< 50

**ATTACHMENT 1 - TABLE 1**

Project Quality Control Objectives for Soil and Groundwater Samples

		Method Detection Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation	
Method No <sup>1</sup>	Analyte / Component	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>
8151A	2,4-Dichlorophenylacetic acid	N/A	N/A	N/A	N/A	20-144	51-146	N/A	N/A	20-144	51-146	N/A	N/A
<b>TRPH BY GC</b>		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%
FL-PRO	TRPH-Florida PRO	250	5000	500	10000	50-120	63-153	< 20	< 20	50-120	63-153	< 20	< 20
FL-PRO	o-Terphenyl	N/A	N/A	N/A	N/A	49-174	43-136	N/A	N/A	49-174	43-136	N/A	N/A
<b>TRPH BY GC</b>		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%
8015B		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>TRPH-GRO BY GC</b>		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%
8015B	Gasoline Range Organics	45	45	100	100	85-118	85-120	< 20	< 20	85-118	85-118	< 20	< 20
8015B	Chlorobenzene	N/A	N/A	N/A	N/A	74-138	64-148	N/A	N/A	64-138	64-138	N/A	N/A
<b>TRPH-DRO BY GC</b>		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%
8015B	Diesel Range Organics	250	2000	500	10000	18-165	18-173	< 20	< 26	51-154	18-173	< 20	< 26
8015B	o-Terphenyl	N/A	N/A	N/A	N/A	49-174	43-136	N/A	N/A	49-174	43-136	N/A	N/A
8015B	Octacosane	N/A	N/A	N/A	N/A	26-152	25-162	N/A	N/A	26-152	25-162	N/A	N/A
<b>Explosives BY HPLC</b>		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%
8330	1,3-Dinitrobenzene	0.25	0.1	1	0.25	47-158	50-150	< 40	< 40	47-158	50-150	< 40	< 40
8330	2,4,6-Trinitrotoluene	0.25	0.1	1	0.25	52-143	50-151	< 40	< 40	52-143	50-151	< 40	< 40
8330	2,4-Dinitrotoluene	0.25	0.1	1	0.25	61-135	50-152	< 40	< 40	61-135	50-152	< 40	< 40
8330	2,6-Dinitrotoluene	0.25	0.1	1	0.26	60-137	50-153	< 40	< 40	60-137	50-153	< 40	< 40
8330	3-Nitrotoluene	0.25	0.1	1	0.25	48-132	50-154	< 40	< 40	48-132	50-154	< 40	< 40
8330	4-Nitrotoluene	0.25	0.1	1	0.25	48-132	50-155	< 40	< 40	48-132	50-155	< 40	< 40
8330	Nitrobenzene	0.25	0.13	1	0.26	49-138	50-156	< 40	< 40	49-138	50-156	< 40	< 40
8330	1,3,5-Trinitrobenzene	0.25	0.1	1	0.25	64-139	50-157	< 40	< 40	64-139	50-157	< 40	< 40
8330	Tetryl	0.25	0.2	1	0.65	22-174	50-158	< 40	< 40	22-174	50-158	< 40	< 40
8330	RDX	0.25	0.1	1	1	51-161	50-159	< 40	< 40	51-161	50-159	< 40	< 40
8330	HMX	0.25	0.1	1	2.2	81-116	50-160	< 40	< 40	81-116	50-160	< 40	< 40
8330	4-Amino-2,6-dinitrotoluene	0.25	0.1	1	0.26	55-154	50-161	< 40	< 40	55-154	50-161	< 40	< 40
8330	2-Amino-4,6-dinitrotoluene	0.25	0.1	1	0.26	50-153	50-162	< 40	< 40	50-153	50-162	< 40	< 40
8330	2-Nitrotoluene	0.25	0.1	1	0.25	43-133	50-163	< 40	< 40	43-133	50-163	< 40	< 40
8330	3,4-Dinitrotoluene	N/A	N/A	N/A	N/A	50-150	50-164	N/A	N/A	50-150	50-164	N/A	N/A
List Additional Compounds and Surrogates													

# ATTACHMENT 1 - TABLE 1

Project Quality Control Objectives for Soil and Groundwater Samples

Method No <sup>1</sup>	Analyte / Component	Method Detection Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation	
		Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>

**ATTACHMENT 1 - TABLE 1**

Project Quality Control Objectives for Soil and Groundwater Samples

		Method Detection Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation	
Method No <sup>1</sup>	Analyte / Component	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>
<b>Methane, Ethane, Ethene, CO2 BY GC</b>		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%
RSK175	Methane	0.25	NA	0.5	NA	51-141	NA	< 55	NA	51-141	NA	< 55	NA
RSK175	Ethane	0.25	NA	0.5	NA	60-136	NA	< 47	NA	60-136	NA	< 47	NA
RSK175	Ethene	0.25	NA	0.5	NA	60-142	NA	< 50	NA	60-142	NA	< 50	NA
RSK175	Carbon Dioxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>Dioxins/Furans BY GC/MS</b>		pg/L	pg/kg	pg/L	pg/kg	%	%	%	%	%	%	%	%
8290	2,3,7,8-Tetrachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
List Additional Compounds, Internal Standards, Surrogates													
Method No <sup>1</sup>	Analyte / Component	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>
<b>METALS BY ICP</b>		mg/L	mg/kg	mg/L	mg/kg	%	%	%	%	%	%	%	%
6010B	Aluminum	0.05	10	0.1	20	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Antimony	0.01	0.5	0.2	10	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Arsenic	0.002	0.5	0.1	5	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Barium	0.0025	0.1	0.01	0.5	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Beryllium	0.00025	0.012	0.01	0.5	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Boron	0.033	10	0.1	25	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Cadmium	0.00025	0.05	0.01	0.5	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Calcium	0.1	5	0.2	10	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Chromium	0.0025	0.12	0.02	1	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Cobalt	0.0025	0.12	0.02	1	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Copper	0.0025	0.5	0.02	1	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Iron	0.02	1	0.04	2	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Lead	0.0025	0.5	0.1	5	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Lithium	0.05	2.5	0.1	5	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Magnesium	0.1	12	0.5	25	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Manganese	0.001	0.1	0.01	0.5	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Molybdenum	0.005	1.5	0.1	5	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6010B	Nickel	0.005	0.5	0.04	2	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Potassium	0.25	25	1	50	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Selenium	0.005	0.5	0.1	5	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Silver	0.002	0.25	0.01	2	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Sodium	0.25	5	0.5	25	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Strontium	0.25	0.25	0.5	0.5	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Thallium	0.1	1	1	25	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Titanium	0.005	0.5	0.03	2	75-125	75-125	<20	<20	80-120	80-120	<20	<20

**ATTACHMENT 1 - TABLE 1**

Project Quality Control Objectives for Soil and Groundwater Samples

Method No <sup>1</sup>	Analyte / Component	Method Detection Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation	
		Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>	Water	Soil <sup>2</sup>
6010B	Vanadium	0.005	0.25	0.01	0.5	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6010B	Zinc	0.005	0.5	0.02	1	75-125	75-125	<20	<20	80-120	80-120	<20	<20
<b>METALS BY ICPMS</b>													
6020A	Antimony	0.0005	0.1	0.001	0.2	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6020A	Arsenic	0.0005	0.25	0.001	0.5	75-125	75-125	<20	<20	80-120	80-120	<20	<20
6020A	Lead	0.0005	0.25	0.001	0.5	75-125	75-125	<20	<20	80-120	80-120	<20	<20

**ATTACHMENT 1 - TABLE 2**

Project Quality Control Objectives for Wet Chemistry Methods for Groundwater Samples

		Method Detection Limits		Minimum PQL		Accuracy Limits <sup>3</sup> MS/MSD recoveries		Precision Limits <sup>3</sup> MS/MSD deviation		Accuracy Limits <sup>3</sup> LCS recoveries		Precision Limits <sup>3</sup> Field Dup deviation	
Method Number <sup>1</sup>	Analyte / Component	Water mg/L	Soil <sup>2</sup> mg/kg	Water mg/L	Soil <sup>2</sup> mg/kg	Water %	Soil <sup>2</sup> %	Water %	Soil <sup>2</sup> %	Water %	Soil <sup>2</sup> %	Water %	Soil <sup>2</sup> %
WET CHEMISTRY													
310.1	Alkalinity	5	N/A	10	N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A
405.1	Biological Oxygen Demand (BOD)	1	N/A	3	N/A	84-114	N/A	<16	N/A	95-121	N/A	<16	N/A
320.1	Bromide	1	N/A	2	N/A	82-110	N/A	<17	N/A	82-110	N/A	<17	N/A
9211	Bromide	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
410.1	Chemical Oxygen Demand (COD)	10	N/A	20	N/A	85-122	N/A	<23	N/A	85-122	N/A	<23	N/A
325.1	Chloride	1	N/A	2	N/A	91-109	N/A	<13	N/A	91-109	N/A	<13	N/A
9212	Chloride	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
300	Cations/Anions by IC - list parameters												
9056	Anions by IC												
9056	Bromide	0.1	N/A	0.5	N/A	80-120	N/A	<30	N/A	90-110	N/A	<30	N/A
9056	Chloride	0.1	N/A	2	N/A	85-123	N/A	<23	N/A	85-123	N/A	<23	N/A
9056	Fluoride	0.1	N/A	1	N/A	90-114	N/A	<14	N/A	90-114	N/A	<14	N/A
9056	Nitrate	0.067	N/A	1	N/A	90-112	N/A	<14	N/A	90-112	N/A	<14	N/A
9056	Nitrite	0.061	N/A	1	N/A	90-112	N/A	<14	N/A	90-112	N/A	<14	N/A
9056	Phosphate	0.163	N/A	2	N/A	84-116	N/A	<20	N/A	84-116	N/A	<20	N/A
9056	Sulfate	0.5	N/A	2	N/A	87-108	N/A	<10.5	N/A	87-108	N/A	<10.5	N/A
7196A	Chromium, Hexavalent	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
335	Cyanide	0.005	N/A	0.005	N/A	90-110	N/A	<15	N/A	83-107	N/A	<15	N/A
9010B/9012A	Cyanide	0.005	N/A	0.01	N/A	90-110	N/A	<15	N/A	83-107	N/A	<15	N/A
7.3.3.2	Cyanide, Reactive	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1010	Flash Point, Pensky-Martens	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1020	Flash Point, SetaFlash	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
340.2	Fluoride	0.05	N/A	0.1	N/A	90-114	N/A	<14	N/A	90-114	N/A	<14	N/A
9214	Fluoride	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ASTM D1385	Hydrazine	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
352	Nitrate	0.025	N/A	0.05	N/A	90-110	N/A	<10	N/A	90-110	N/A	<10	N/A
9210	Nitrate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
353	Nitrate/Nitrite	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
354	Nitrite	0.005	N/A	0.01	N/A	84-111	N/A	<8	N/A	84-111	N/A	<8	N/A
350	Ammonia as N	0.05	N/A	0.1	N/A	75-111	N/A	<22	N/A	75-111	N/A	<22	N/A
351	Total Kjeldahl Nitrogen	0.05	N/A	0.1	N/A	57-131	N/A	<46	N/A	57-131	N/A	<46	N/A
413	Oil and Grease	0.5	N/A	1	N/A	65-112	N/A	<17	N/A	65-112	N/A	<17	N/A
9070	Oil and Grease		N/A		N/A		N/A		N/A		N/A		N/A
9071B	Oil and Grease	N/A		N/A		N/A		N/A		N/A		N/A	
300	Perchlorate		N/A		N/A		N/A		N/A		N/A		N/A

**ATTACHMENT 1 - TABLE 2**

Project Quality Control Objectives for Wet Chemistry Methods for Groundwater Samples

		Method Detection Limits		Minimum PQL		Accuracy Limits <sup>3</sup> MS/MSD recoveries		Precision Limits <sup>3</sup> MS/MSD deviation		Accuracy Limits <sup>3</sup> LCS recoveries		Precision Limits <sup>3</sup> Field Dup deviation	
Method Number <sup>1</sup>	Analyte / Component	Water mg/L	Soil <sup>2</sup> mg/kg	Water mg/L	Soil <sup>2</sup> mg/kg	Water %	Soil <sup>2</sup> %	Water %	Soil <sup>2</sup> %	Water %	Soil <sup>2</sup> %	Water %	Soil <sup>2</sup> %
WET CHEMISTRY													
314	Perchlorate		N/A		N/A		N/A		N/A		N/A		N/A
150	pH, Electrometric	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9040B	pH, Electrometric	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9045C	pH, Electrometric	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9065	Phenolics, Tot Recov	0.003	N/A	0.005	N/A	73-127	N/A	<27	N/A	73-127	N/A	<127	N/A
365	Phosphate	0.025	N/A	0.05	N/A	84-116	N/A	<20	N/A	84-116	N/A	<20	N/A
365.2	Phosphorus, Total	0.05	N/A	0.1	N/A	71-108	N/A	<23	N/A	71-108	N/A	<23	N/A
160.1	Residue, Filterable (TDS)	5	N/A	10	N/A	86-108	N/A	<14	N/A	86-108	N/A	<14	N/A
160.2	Residue, Nonfilterable (TSS)	2.5	N/A	5	N/A	79-122	N/A	<27	N/A	79-122	N/A	<27	N/A
160.3	Residue, Total	5	N/A	10	N/A	89-108	N/A	<12	N/A	89-108	N/A	<12	N/A
120.1	Specific Conductance	0.5	N/A	1	N/A	92-111	N/A	<9	N/A	92-111	N/A	<9	N/A
9050A	Specific Conductance	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
375.4	Sulfate	1	N/A	2	N/A	92-113	N/A	<13	N/A	92-113	N/A	<13	N/A
9035	Sulfate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
376	Sulfide	0.5	N/A	1	N/A	86-109	N/A	<3	N/A	86-107	N/A	<3	N/A
9030B	Sulfide	0.5	N/A	1	N/A	82-112	N/A	<18	N/A	82-112	N/A	<16	N/A
7.3.4.2	Sulfide, Reactive	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
377	Sulfite	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
415.1	Total Organic Carbon	0.5	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9060	Total Organic Carbon	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9020B	Total Organic Halides	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
180.1	Turbidity	0.06	N/A	0.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MISCELLANEOUS													
ASTM D1385	Hydrazine	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Metabolic Acids		N/A		N/A		N/A		N/A		N/A		N/A
9095A	Paint Filter Test	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9310	Gross Alpha/Beta - Radiological	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

1. SW-846 Methods unless otherwise noted

2. Includes sediments, waste, solids

NS = Not Specified

NA = Not Applicable

**ATTACHMENT 1 - TABLE 3**

Project Quality Control Objectives for Soil Disposal Samples

Method No	Analyte / Component	Method Detection Limits	Minimum PQL	Accuracy Limits	Precision Limits	Accuracy Limits	Precision Limits
				MS/MSD Recoveries	MS/MSD Deviation	LCS Recoveries	Field Dup Deviation
Method No	Analyte / Component	TCLP	TCLP	TCLP	TCLP	TCLP	TCLP
<b>TCLP Volatiles</b>		(mg/L)	(mg/L)	(%)	(%)	(%)	(%)
8260B	1,1-Dichloroethylene	0.25	5	80-125	<40	80-125	<40
8260B	1,2-Dichloroethane	0.25	5	81-136	<40	81-136	<40
8260B	Benzene	0.125	5	80-123	<20	80-123	<20
8260B	Carbon Tetrachloride	0.25	5	80-140	<20	80-140	<20
8260B	Chlorobenzene	0.125	5	80-120	<20	80-120	<20
8260B	Chloroform	0.125	5	80-125	<20	80-125	<20
8260B	Methyl Ethyl Ketone	2.5	100	53-126	<20	53-126	<20
8260B	Tetrachloroethylene	0.25	5	80-126	<20	80-126	<20
8260B	Trichloroethylene	0.25	5	80-125	<20	80-125	<20
8260B	Vinyl Chloride	0.25	10	61-164	<20	61-164	<20
<b>TCLP Semi-Volatiles</b>		(mg/L)	(mg/L)	(%)	(%)	(%)	(%)
8270C	1,4-Dichlorobenzene	5	10	30-125	<63	13-103	<63
8270C	2,4,5-Trichlorophenol	25	50	25-125	<63	58-135	<63
8270C	2,4,6-Trichlorophenol	5	10	39-128	<63	38-121	<63
8270C	2,4-Dinitrotoluene	5	10	39-139	<63	1-157	<63
8270C	Cresol	5	10	33-125	<35	18-99	<35
8270C	Hexachlorobenzene	5	10	46-133	<63	68-131	<63
8270C	Hexachloroethane	5	10	25-153	<63	13-102	<63
8270C	Hexachlorobutadiene	5	10	25-125	<63	10-109	<63
8270C	Nitrobenzene	5	10	46-153	<63	22-108	<63
8270C	Pentachlorophenol	25	50	28-136	<63	59-140	<63
8270C	Pyridine	5	10	2-155	<63	2-155	<63
<b>TCLP Pesticides</b>		(mg/L)	(mg/L)	(%)	(%)	(%)	(%)
8081A	Endrin	0.013	0.1	54-152	<40	54-152	<40
8081A	Lindane	0.01	0.05	66-108	<11	66-108	<11
8081A	Methoxychlor	0.007	0.5	70-137	<10	70-137	<10
8081A	Toxaphene	0.38	1	39-128	<39	39-128	<39
8081A	Chlordane	0.0091	1	44-120	<38	44-120	<38
8081A	Heptachlor and its Hydroxide	0.012	0.05	75-116	<22	75-116	<22
<b>TCLP Herbicides</b>		(mg/L)	(mg/L)	(%)	(%)	(%)	(%)
8151A	2,4-D	1.1	10	81-305	<44	81-305	<44
8151A	2,4,5-TP	0.45	2	72-247	<51	72-247	<51
<b>TCLP Metals</b>		(mg/L)	(mg/L)	(%)	(%)	(%)	(%)
6010B	Arsenic	0.1	1	75-125	<20	80-120	<20
6010B	Barium	0.025	0.1	75-125	<20	80-120	<20
6010B	Cadmium	0.025	0.1	75-125	<20	80-120	<20
6010B	Chromium	0.025	0.1	75-125	<20	80-120	<20
6010B	Lead	0.1	1	75-125	<20	80-120	<20
7470	Mercury	0.00016	0.005	75-125	<20	80-120	<20
6010B	Selenium	0.5	0.8	75-125	<20	80-120	<20
6010B	Silver	0.05	0.1	75-125	<20	80-120	<20

# ATTACHMENT 1 - TABLE 3

Project Quality Control Objectives for Soil Disposal Samples

Method No	Analyte / Component	Method Detection Limits	Minimum PQL	Accuracy Limits	Precision Limits	Accuracy Limits	Precision Limits
				MS/MSD Recoveries	MS/MSD Deviation	LCS Recoveries	Field Dup Deviation
Method No	Analyte / Component	TCLP	TCLP	TCLP	TCLP	TCLP	TCLP
Characteristics		(mg/kg)	(mg/kg)	(%)	(%)	(%)	(%)
7.3.3.2	Reactive Cyanide			N/A		N/A	
7.3.4.2	Reactive Sulfide			N/A		N/A	
1010	Ignitability (Pensky Martens)	< 60 C or <140oF	40 C or 100oF	N/A		N/A	
1020A	Ignitability (Setaflash)			N/A		N/A	
1030	Ignitability of Solids			N/A		N/A	
9040B	pH (Corrosivity)	≤2 ; ≥12.5	N/A	N/A		N/A	
Miscellaneous				(%)	(%)	(%)	(%)
9095A	Paint Filter	Pass	Pass/Fail	N/A	N/A	N/A	N/A

1. SW-846 Methods unless otherwise noted

2. Includes sediments, waste, solids

NS = Not Specified

NA = Not Applicable

**ATTACHMENT 2**  
**AUTHORIZATION LETTERS**



September 28, 2005

50001.001

Mr. Michael Lamon  
Cape, Inc.  
11852 Kingston Pike, Suite 2  
Knoxville, TN 37922

**Re: OU-1 Remedial Action, Cornell-Dubilier Electronics Superfund Site South Plainfield, NJ  
Contract No. W912DQ-05-D-0001, Task Order 001  
Project Manager Delegation of Authority**

Dear Mr. Lamon:

This letter is to authorize you to act for Cape Environmental Management Inc. (CAPE) as the Project Manager for the above referenced project. This delegation of authority is consistent with responsibility and authority described in the above referenced contract. You will have no other duties than those specified for the Project Manager and are authorized to act on CAPE's behalf in the following manner:

- Ensure the project is being performed in a manner consistent with the CAPE Corporate Health and Safety Program, the Scope of Work, and the Base Specification Requirements
- Ensure that all required plans (SSHP, CQCP, SAP, EPP and Work Plan) are prepared, submitted in a timely manner, and approved by the USACE
- Provide project personnel with information related to health and safety matters and other critical issues related to the project
- Monitor compliance with the project requirements by CAPE and subcontractor personnel
- Ensure adequate resources are provided to the health and safety staff so that they may carry out their duties
- Maintain communication with the USACE authorized representative
- Develop cost control documentation and all notifications to the USACE.
- You will also have the authority to take the following actions:
- Determine personnel assignments on this project
- Stop site activities if an imminently dangerous situation exists. The emergency situation will be immediately reviewed with the Site Superintendent, SSHO, Corporate Health and Safety Manager, and the USACE authorized representative

In addition, this letter is to inform you that your alternate for this project is Ed King. Only in your absence will Ed King be responsible for the management duties outlined above.

If you have any questions, please feel free to give Ed King a call at (610) 594-8606.

Sincerely,  
CAPE, Inc.

Kurt Gates, CH  
Vice President

Copy to: P. Nejad- USACE  
E. King, M. Lamon, C. Reed - CAPE



September 28, 2005

50001.001

Mr. Charles Reed  
Cape, Inc.  
180 Gordon Drive, Suite 102  
Exton, Pennsylvania 19341-1340

**Re: OU-1 Remedial Action  
Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey  
Contract No. W912DQ-05-D-0001, Task Order 001  
CQCSM Delegation of Authority**

Dear Mr. Reed:

This letter is to authorize you to act for Cape Environmental Management Inc. (CAPE) as the Contractor Quality Control Systems Manager (CQCSM) for the above referenced project. This delegation of authority is consistent with responsibility and authority described in the above referenced contract. You will have no other duties than those specified for the CQCSM and are authorized to act on CAPE's behalf in the following manner:

- Perform all CQCSM duties for the project.
- Direct work to ensure compliance with approved statement of work, work plans, drawings, specifications, and applicable regulations.
- Stop work which is not in compliance with the contract.
- Designate and supervise QC Task managers, as necessary.
- Prepare and submit project submittals.
- Coordinates and supervises QC tests.
- Prepares daily activity reports.

In addition, this letter is to inform you that the alternate CQCSM for this project is Eric Lynch. Only in your absence will Mr. Lynch be responsible for CQCSM duties outlined above.

If you have any questions, please feel free to give Ed King a call at (610) 594-8606 or Michael Lamon, CAPE Project Manager at (865) 671-1142.

Sincerely,  
CAPE, Inc.



Kurt Gates, CIH  
Vice President

Copy to: P. Nejang - USACE  
E. King - CAPE  
M. Lamon - CAPE  
C Reed - CAPE



[illegible]

<b>4. Control Activities Performed:</b>	
<ul style="list-style-type: none"> <li><b>Preparatory Inspections:</b> (Identify features of work and attach minutes).</li> </ul>	<b>Comments</b>
-	
<ul style="list-style-type: none"> <li><b>Initial Inspections:</b> (Identify features of work and attach minutes).</li> </ul>	<b>Comments</b>
-	
<ul style="list-style-type: none"> <li><b>Follow-up Inspections:</b> (List inspections performed, results of inspection compared to the specification requirements, and corrective actions taken when deficiencies are noted).</li> </ul>	<b>Comments</b>
-	

<b>5. Erosion &amp; Sediment Control Inspection:</b>
Name of Inspector:
Erosion Controls Inspected:
Observations:
Maintenance Performed:
Reason for Inspection (weekly requirement or storm event):

<b>6. Tests Performed and Test Results:</b>
-

<b>7. Material Received:</b> (Note inspection results and storage provided).								
						<b>Inspection Results</b>		
Item	Daily Quantity	Cumulative Quantity	Units	Description	Storage Provided	Accept	Reject	Comments

<b>8. Submittals Reviewed:</b>				
Submittal No.	Spec/Plan Reference	What was submitted	By Whom	Action

<b>9. Offsite Surveillance Activities:</b> (Include actions taken).
- None

<b>10. Transportation and Disposal Summary.</b>				
<b>Non-Hazardous Transportation and Disposal</b>				
Waste Type	Daily Volume	Cumulative Volume	Transporter	Disposal Facility
Liquid				
Sediment/Sludge				
Comments				

<b>11. Job Safety:</b> (List items checked, results, instructions, and corrective actions taken).
-

<b>12. Remarks:</b> (Instructions received or given. Conflict(s) in Plans and/or specifications. Delays encountered).	
-	
-	

<b>13. Planned Activities:</b> (List anticipated field activities for next day of work).

<b>14. Safety Hours:</b>	
-	Daily safety hours including CAPE and subcontractors: ____ <b>Hours</b>
-	Safety hours to date (____ days total): ____ <b>Hours</b>

**Contractor's Verification:** On behalf of the Contractor, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as may be noted above.

\_\_\_\_\_  
**QC Officer**

\_\_\_\_\_  
**Date**

## PREPARATORY INSPECTION OUTLINE

Contract No.: \_\_\_\_\_

Date: \_\_\_\_\_

Title and No. of Technical Section: \_\_\_\_\_

Reference Contract Drawings: \_\_\_\_\_

### A. PLANNED ATTENDANTS:

	<u>NAME</u>	<u>POSITION</u>	<u>COMPANY</u>
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____

### B. SUBMITTALS REQUIRED TO BEGIN WORK:

	<u>ITEM</u>	<u>SUBMITTAL NO.</u>	<u>ACTION CODE</u>
a.	_____	_____	_____
b.	_____	_____	_____
c.	_____	_____	_____
d.	_____	_____	_____

I HEREBY DECLARE THAT THE ABOVE-REQUIRED MATERIALS DELIVERED TO THE JOBSITE ARE CERTIFIED TO BE THE SAME AS THOSE SUBMITTED AND APPROVED.

\_\_\_\_\_  
Quality Control Representative

### C. EQUIPMENT TO BE USED IN EXECUTING WORK:

a. \_\_\_\_\_  
b. \_\_\_\_\_  
c. \_\_\_\_\_

### D. WORK AREAS EXAMINED TO ASCERTAIN THAT ALL PRELIMINARY WORK HAS BEEN COMPLETED:

\_\_\_\_\_  
\_\_\_\_\_

### E. METHODS AND PROCEDURES FOR PERFORMING QUALITY CONTROL - INCLUDING SPECIFIC TESTING REQUIREMENTS:

\_\_\_\_\_  
\_\_\_\_\_

THE ABOVE METHODS AND PROCEDURES OUTLINED ARE CERTIFIED TO COMPLY WITH THE CONTRACT REQUIREMENTS AND WILL BE PERFORMED AS PLANNED AND SPECIFIED.

\_\_\_\_\_  
Quality Control Representative

# INITIAL AND FOLLOW-UP PHASE CHECKLIST

☐ INITIAL  
☐ FOLLOW-UP

Contract No.: \_\_\_\_\_

Date: \_\_\_\_\_

Specification Paragraph or Section: \_\_\_\_\_

Description and Location of Work Inspected: \_\_\_\_\_

REFERENCE CONTRACT DRAWINGS: \_\_\_\_\_

**A. PERSONNEL PRESENT:**

	<u>NAME</u>	<u>POSITION</u>	<u>COMPANY</u>
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____

**B. MATERIALS AND EQUIPMENT BEING USED ARE IN STRICT COMPLIANCE WITH THE CONTRACT PLANS AND SPECIFICATIONS:** YES \_\_\_\_\_ NO \_\_\_\_\_  
IF NOT, EXPLAIN:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**C. PROCEDURES AND/OR WORK METHODS WITNESSED ARE IN STRICT COMPLIANCE WITH THE CONTRACT SPECIFICATIONS:** YES \_\_\_\_\_ NO \_\_\_\_\_  
IF NOT, EXPLAIN:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**D. WORKMANSHIP IS ACCEPTABLE:** YES \_\_\_\_\_ NO \_\_\_\_\_  
STATE AREAS WHERE IMPROVEMENT IS NEEDED:

\_\_\_\_\_  
\_\_\_\_\_

**E. TESTS PERFORMED:** \_\_\_\_\_

**F. SAFETY VIOLATIONS NOTED:** YES \_\_\_\_\_ NO \_\_\_\_\_  
IF YES, CORRECTIVE ACTION TAKEN:

\_\_\_\_\_  
\_\_\_\_\_

**G. IS REINSPECTION REQUIRES:** YES \_\_\_\_\_ NO \_\_\_\_\_  
IF SO, LIST ITEMS OR AREAS REQUIRING REINSPECTION:

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
Quality Control Representative

**FIELD INSPECTION REPORT****Contract No.:****Client:****Report No.:****Prepared By:****Location:****Date:****Description**Visual ☐NDE ☐In Progress ☐Dimensional ☐Other ☐Final ☐**Reference Drawing/Standard****Findings****Sketch**\_\_\_\_\_  
**Inspector**\_\_\_\_\_  
**Date**

Page \_\_\_\_\_ of \_\_\_\_\_

Date: \_\_\_\_\_

## NONCONFORMANCE REPORT

Project Name: \_\_\_\_\_ Project Number: \_\_\_\_\_

Nonconformance: \_\_\_\_\_

Identified by: \_\_\_\_\_ Date: \_\_\_\_\_

Corrective Action Required to Rectify  
and to Prevent Recurrence:

Prepared By: \_\_\_\_\_  
Date: \_\_\_\_\_

To Be Performed By: \_\_\_\_\_ Date: \_\_\_\_\_

Must Correction be Verified? Yes \_\_\_\_\_ No \_\_\_\_\_

To Be Verified By: \_\_\_\_\_

Corrective Action Taken: \_\_\_\_\_

Performed By: \_\_\_\_\_

Date: \_\_\_\_\_

Verified By: \_\_\_\_\_

Date: \_\_\_\_\_

## CQC TEST REPORT LIST

CQC REPORT # \_\_\_\_\_ SH \_\_\_\_\_ OF \_\_\_\_\_ DATE: \_\_\_\_\_

CONTRACTOR: \_\_\_\_\_ CONTRACT # \_\_\_\_\_

PROJECT TITLE: \_\_\_\_\_ LOCATION: \_\_\_\_\_

SPEC REF OR DWG#	TYPE OF TEST	DATE PERFORMED	RESULTS	REMARKS

Note: This form shall be used by the Contractor to track CQC Testing. Provide attachments as required.

## LIST OF OUTSTANDING DEFICIENCIES

SH \_\_\_\_ OF \_\_\_\_ DATE: \_\_\_\_

PROJECT TITLE: \_\_\_\_\_

CONTRACTOR: \_\_\_\_\_

LOCATION: \_\_\_\_\_ CQC REPORT #: \_\_\_\_\_

CONTRACT #: \_\_\_\_\_

SPEC REF OR DWK#	LOCATION ON PROJECT	DESCRIPTION OF DEFICIENCY	DATE FOUND	DATE TO BE CORRECTED	DATE CORRECTED	REMARKS

Note: This form shall be used by the Contractor to track outstanding construction deficiencies

## RECORD OF PREPARATORY AND INITIAL INSPECTIONS

DATE OF INSP	TYPE OF INSPECTION	DEFINABLE FEATURE OF WORK (DESCRIBE)	REPORT NOS		PERSONS ATTENDING INSP	WAS MAT'L AND/OR EQUIPMENT PHYSICALLY INSPECTED?
			QA	QA		

Note: This form shall be used by the Contractor to track prep/init inspections. Attach additional results or comments as required



## INSTRUCTIONS

1. Section I will be initiated by the Contractor in the required number of copies.
2. Each transmittal shall be numbered consecutively in the space provided for "Transmittal No." This number, in addition to the contract number, will form a serial number for identifying each submittal. For new submittals or resubmittals mark the appropriate box; on resubmittals, insert transmittal number of last submission as well as the new submittal number.
3. The "Item No." will be the same "Item No." as indicated on ENG FORM 4288 for each entry on this form.
4. Submittals requiring expeditious handling will be submitted on a separate form.
5. Separate transmittal form will be used for submittals under separate sections of the specifications.
6. A check shall be placed in the "Variation" column when a submittal is not in accordance with the plans and specifications -- also, a written statement to that effect shall be included in the space provided for "Remarks."
7. Form is self-transmittal, letter of transmittal is not required.
8. When a sample of material or Manufacturer's Certificate of Compliance is transmitted, indicate "Sample" or "Certificate" in column c, Section I.
9. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided Section I, column I to each item submitted. In addition, they will ensure enclosures are indicated and attached to the form prior to return to the contractor. The Contractor will assign action codes as indicated below in Section I, column g, to each item submitted.

### THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS SUBMITTED

A -- Approved as submitted.	E -- Disapproved (See attached)
B -- Approved, except as noted on drawings.	F -- Receipt acknowledged
C -- Approved, except as noted on drawings. Refer to attached sheet resubmission required.	FX -- Receipt acknowledged, does not comply as noted with contract requirements.
D -- Will be returned by separate correspondence.	G -- Other ( <i>Specify</i> )

- 10: Approval of items does not relieve the contractor from complying with all the requirements of the contract plans and specifications.

Reverse of ENG Form 4025

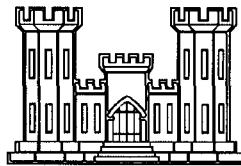
1



**ACCIDENT PREVENTION PLAN**  
**REMEDIAL DESIGN**  
**FINAL**  
**OPERABLE UNIT 1**  
**CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE**  
**SOUTH PLAINFIELD, NEW JERSEY**

**Contract Number W912DQ-05-D-0001**  
**Task Order Number 001**

*Prepared for:*



**DEPARTMENT OF THE ARMY**  
**KANSAS CITY DISTRICT**  
**CORPS OF ENGINEERS**  
**700 Federal Building**  
**Kansas City, Missouri 64106-2896**

*Prepared by:*

**CAPE<sup>SM</sup>**

**CAPE**  
**180 Gordon Drive, Suite 102**  
**Exton, Pennsylvania 19341**

**CAPE Project Number 50001.001.001.002**  
**October 2005**

**FINAL  
ACCIDENT PREVENTION PLAN**

**CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE SOUTH PLAINFIELD,  
NEW JERSEY**

**Contract Number W912DQ-05-D-0001  
Task Order 001**

**October 2005**

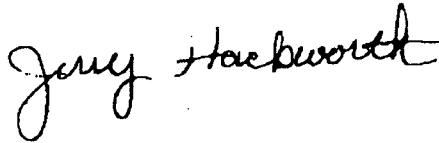
The following Plan has been prepared in response to a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Record of Decision (ROD) and the signatories below have reviewed and approved the plan for compliance with project requirements.



10/26/05

Approved by: \_\_\_\_\_  
Michael Lamon  
Cape Environmental  
Project Manager

Date



1/27/06

Approved by: \_\_\_\_\_  
Jerry Hackworth  
Cape Environmental  
Site Superintendent

Date



1/27/06

Approved by: \_\_\_\_\_  
Ken Beatty  
Cape Environmental  
Site Safety and Health Officer

Date



10/26/05

Approved by: \_\_\_\_\_  
Glen Mayekawa, CIH  
Cape Environmental  
Safety and Health Manager

Date

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### ATTACHMENTS

- A Accident Prevention Plan Review Form
  
- B Resumes for SHM and SSHO
  - SHM Resume (Glen Mayekawa, CIH)
  - SSHO Resume (Eric Lynch)
  
- C Site Safety and Health Plan

## LIST OF ABBREVIATIONS AND ACRONYMS

AHA	Activity Hazard Analysis
APP	Accident Prevention Plan
CDE	Cornell-Dublier Electronics
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CHSM	Corporate Health and Safety Manager
COR	Contracting Officer's Representative
CPR	Cardiopulmonary Resuscitation
CSHP	CAPE Safety and Health Program
EM-385-1-1	USACE <i>Safety and Health Requirements Manual</i>
EMR	Experience Modification Rate
EPA	U.S. Environmental Protection Agency
MSDS	Material Safety Data Sheet
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PCB	Polychlorinated Biphenyl
PM	Project Manager
POC	Point of Contact
PPE	Personal Protective Equipment
PS	Project Superintendent
ROD	Record of Decision
S&H	Safety and Health
SHM	Safety and Health Manager
SOW	Statement of Work
SOP	Standard Operating Procedure
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
USACE	U.S. Army Corp of Engineers
VOC	Volatile Organic Compound

## 1.0 BACKGROUND INFORMATION

CAPE recognizes a responsibility to provide employees with a safe and healthful workplace and to provide clients with safe and effective services. Through implementation of a project Accident Prevention Plan (APP) and Site Safety and Health Plan (SSHP), CAPE seeks to take proactive measures to recognize, evaluate, and control workplace hazards and to implement preventive actions to minimize the potential for employee injuries and illnesses. The APP presents the contractor safety and health (S&H) procedures to be implemented by CAPE for services associated with the U.S. Army Corps of Engineers (USACE), Cornell-Dublier Electronics (CDE) Superfund Site Operable Unit (OU)-1 Phase A Remedial Action, South Plainfield, New Jersey project. CAPE project work will be conducted under a contract with the USACE Kansas City District.

The APP contains accident prevention provisions established in Appendix A of the USACE *Safety and Health Requirements Manual* (EM-385-1-1), dated 3 Nov 2003. The APP along with the SSHP establishes the written S&H program for personnel involved in project fieldwork and applies and interfaces in conjunction with requirements of the CAPE Safety and Health Program (CSHP).

The APP has been prepared to meet the requirements of: U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) standards, Title 29 Code of Federal Regulations (CFR) Part 1910 and 29 CFR Part 1926; USACE EM 385-1-1; and the USACE, Kansas City District, project Statement of Work (SOW) dated 8 March 2005.

The primary objective of the APP is to provide the field team with a safe working environment during fieldwork. The APP contains the following major categories of information:

- ▲ Signature Sheet
- ▲ Background Information
- ▲ Statement of Safety and Health Policy
- ▲ Responsibilities and Lines of Authority
- ▲ Subcontractors and Suppliers
- ▲ Training
- ▲ Safety and Health Inspections
- ▲ Safety and Health Expectations, Incentive Programs and Compliance
- ▲ Accident Reporting
- ▲ Medical Support
- ▲ Personal Protective Equipment (PPE)
- ▲ Plans Required by the Safety Manual
- ▲ Contractor Information
- ▲ Site-Specific Hazards and Controls.

The APP will be primarily implemented by the CAPE Project Manager (PM), Project Superintendent (PS), Site Safety and Health Officer (SSHO), and Safety and Health Manager (SHM) in coordination with the USACE Contracting Officer's Representative (COR) and U.S. Environmental Protection Agency (EPA) Point of Contact (POC).

Compliance with the APP is required of all CAPE personnel, subcontractors, and associated third parties on site. A copy of the APP will be maintained on site during work activities and will be available for inspection and review by site or agency personnel. Field personnel will review applicable aspects of the APP before site work and will sign an "APP Review" acknowledgment form (Attachment A) indicating they have reviewed the pertinent aspects of the plan.

The content of the APP may be revised and/or amended should additional information become available regarding the hazards present at the site and/or should significant changes occur in the scope of work, operational procedures, site hazards, and/or hazard control measures. The APP may be modified by the SSHO upon review and approval of the COR, PM, and SHM. Field personnel are informed of changes to the APP and SSHP through safety meetings and written addendum or revision to the APP.

### 1.1 Site Locations and Background

The CDE site is located at 333 Hamilton Boulevard, South Plainfield, Middlesex County, New Jersey. The former CDE facility, now known as the Hamilton Industrial Park, consists of approximately 26 acres

containing 18 buildings that are currently used by a variety of commercial and industrial tenants. The CDE site is on the National Priorities List due to polychlorinated biphenyl (PCB) contamination found in soil and buildings. This project task order focuses on OU-1 PCB-contaminated soils and properties in the vicinity of the former CDE facility.

Before 1936, Spicer Manufacturing Corp., a predecessor to Dana Corporation, owned and operated the facility, and many of the buildings date from this era. Spicer Manufacturing Corp. ceased operations in South Plainfield in 1929 and, beginning in 1936, leased the property to CDE. CDE operated in South Plainfield from 1936 to 1962, manufacturing electronics components including, in particular, capacitors. PCBs and chlorinated organic solvents were used in the manufacturing process, and the company apparently disposed of PCB-contaminated materials and other hazardous substances directly on the facility soils. CDE's activities evidently led to widespread chemical contamination at the facility, as well as migration of contaminants to areas adjacent to the facility. PCBs have been detected in the groundwater, soils and in building interiors at the industrial park, at adjacent residential, commercial, and municipal properties, and in the surface water and sediments of the Bound Brook. High levels of volatile organic compounds (VOCs) have been found in the facility soils and in groundwater. Since CDE's departure from the facility in 1962, it has been operated as a rental property, with over 100 commercial and industrial companies operating at the facility as tenants.

The EPA has divided the site into separate phases, or operable units, for remediation purposes. OU-1 consists of residential, commercial, and municipal properties located in the vicinity of the former CDE facility. OU-2 addresses the former CDE facility, consisting of contaminated facility soils and buildings at the former CDE facility, including soils that may act as a source of groundwater contamination. Additional operable units will address contaminated groundwater and the sediments of the Bound Brook.

## 1.2 Project Work Tasks

Project work shall be performed design, plan, and perform excavation and offsite disposal of contaminated soil; restoration of properties to pre-excavation conditions; sampling and analysis of soil, air, and interior building dust; review and compile existing right-of-way and study area data; and other activities as necessary to support EPA Region 2 in achieving the remedial goals set forth in the CDE Superfund Site Record of Decision (ROD) for OU-1 (September 2003).

Project activities involve the excavation; transportation and disposal; sampling and analysis; and site restoration activities associated with the excavation of approximately 750 cubic yards of PCB-contaminated soil from four vicinity properties designated as OU-1, Phase A. Properties designated as OU-1, Phase A include:

- ▲ *Addresses redacted*
- ▲
- ▲
- ▲

## 1.3 CAPE Primary Work Tasks

For the purposes of this plan, CAPE has organized the project scope of work into the following primary fieldwork activities. Activity Hazard Analyses (AHAs) have been established for these primary work tasks and are included in an appendix of the SSHP.

- ▲ Mobilization and site preparation
- ▲ Soil excavation, transportation and disposal
- ▲ Sampling and analysis
- ▲ Site restoration and demobilization.

## 2.0 STATEMENT OF SAFETY AND HEALTH POLICY

CAPE has established this project APP to assist in providing a safe and healthful workplace. CAPE recognizes a responsibility to provide employees with a safe and healthful workplace and to provide clients with safe and effective services. CAPE considers safe operations and accident prevention to be a priority. One of CAPE's goals

for accident prevention is to maintain its excellent accident experience record. CAPE accident experience history (experience modification rate [EMR], recordable injury case rate, and lost workday injury case rate) for the past three years is as follows:

- ▲ 2002: EMR of 0.84, recordable injury case rate of 5.61, and lost workday injury case rate of 4.59
- ▲ 2003: EMR of 0.82, recordable injury case rate of 2.34, and lost workday injury case rate of 1.17
- ▲ 2004: EMR of 0.87, recordable injury case rate of 3.56, and lost workday injury case rate of 1.19.

Through implementation of this APP, CAPE seeks to take proactive measures to anticipate, recognize, evaluate, and control workplace hazards and to implement preventive actions to minimize the potential for employee injuries and illnesses. The safety of employees is considered to be of paramount concern in performance of company operations as employees are our most important asset and their well being our greatest responsibility. The S&H of every worker must be a primary consideration in every business decision and plan. CAPE management will maintain an S&H program that conforms to the best practice of organizations of this type. To be successful, such a program must encourage proper attitudes toward accident prevention on the part of both supervisors and employees. It also requires cooperation in all S&H program aspects, not only between supervisors and employees, but also between employees and their fellow workers. Only through such a cooperative effort can an effective S&H program be maintained.

One of the primary objectives of the CAPE S&H program is to prevent accident occurrence. There is no phase of company operations of greater importance than accident prevention. Accidents and injuries can be prevented. Our goal is zero accidents and injuries. A good safety record is evidence of effective managerial performance and preserves both human and economic resources of the company. It is CAPE's policy to do everything reasonable to protect employees, subcontractors, clients, and the public from the results of accidents.

To establish and maintain an effective S&H program, the following must be accomplished:

- ▲ Provide a safe work environment by having a safe workplace, equipment, and materials
- ▲ Establish safe work operations, safe work rules and procedures, and comply with accepted safe work practices and S&H regulations
- ▲ Provide S&H training to help personnel work safely and to promote an understanding that each individual has a duty and responsibility to protect themselves and others
- ▲ Everyone in this organization must actively support and participate in the CAPE Safety and Health Program and accept the premise that "Accidents Can Be Prevented."

### **3.0 RESPONSIBILITIES AND LINES OF AUTHORITIES**

SSHP Section 2 "Project Organization" indicates the key project personnel and provides a description of CAPE personnel S&H responsibilities. Listed personnel include those individuals serving in the following functions: COR (USACE), POC (EPA), PM (CAPE), PS (CAPE), SSHO (CAPE), and SHM (CAPE).

The SSHO has a direct reporting relationship to the SHM regarding all S&H matters. The SHM has a direct reporting relationship to the CAPE Vice President of Risk Management and Compliance. Resumes for the SSHO and SHM are provided as Attachment B.

### **4.0 SUBCONTRACTORS AND SUPPLIERS**

Subcontractors will be used to provide selected services associated with performance of project work. Subcontractors who come on site to perform fieldwork and/or enter controlled areas of the site are subject to SSHP requirements. CAPE requirements for controlling and coordinating subcontractor compliance with S&H requirements are detailed below.

- ▲ Subcontractors are required to follow applicable Federal, State, and local governmental regulations, applicable requirements of the CAPE SSHP, and customer requirements for work at their facilities
- ▲ Subcontractor workers are required to obey directives from the SSHO

- ▲ Subcontractor personnel who do not comply with S&H requirements may be immediately dismissed from the site by the PM, PS and/or SSHO
- ▲ Subcontractor personnel (or subcontractor representative) will attend daily safety meetings conducted by the SSHO prior to starting work to review work operations and to discuss pertinent site safety topics
- ▲ Provide copies of required S&H training and certification documents to the SSHO, as applicable (i.e., licenses, training certifications, medical clearance [fitness for duty] certification, first-aid/cardiopulmonary resuscitation [CPR] training, respirator fit testing)
- ▲ Provide, before site work, a hazardous substances inventory list and copies of applicable Material Safety Data Sheets (MSDSs) to the SSHO for hazardous substances to be brought on site by the subcontractor
- ▲ Provide an AHA for subcontractor work activities. A detailed AHA is required for every phase of operations from all participants. The detail for the AHA should be to the extent that every phase and the tasks involved in those phases are considered to identify the associated hazards and risks during the operation. These task and hazard risk analyses must be modified as needed to address a changing work environment
- ▲ Enforce applicable SSHP requirements with subcontractor employees
- ▲ Review, understand, and comply with the SSHP and safety instructions from the SSHO, or other competent authority
- ▲ Observe the buddy system during work activities
- ▲ Promptly report unsafe work conditions or unsafe work practices to the subcontractor supervisor and the SSHO
- ▲ Immediately report all injuries or illnesses to the subcontractor supervisor and the SSHO.

## 5.0 TRAINING

SSHP Section 10 "Training" provides a description of CAPE training procedures and requirements. Copies of S&H training certificates will be reviewed and maintained by the SSHO. Personnel will not be allowed to perform fieldwork until the SSHO has determined this documentation to be complete and sufficient. Workers assigned to fieldwork on this project are required to have completed the following training:

- ▲ Hazardous waste operations 40-hour initial worker training (site personnel)
- ▲ Hazardous waste operations 8-hour refresher training (site personnel)
- ▲ Hazardous waste operations 8-hour supervisor training (supervisors)
- ▲ First-Aid/CPR training (minimum of 2 persons onsite)
- ▲ Construction S&H 10-hour training (SSHO)
- ▲ Excavation safety training (excavation competent person)
- ▲ Confined space training (confined space entry personnel)
- ▲ Forklift operator training (forklift operators).

## 6.0 SAFETY AND HEALTH INSPECTIONS

SSHP Section 8.2.7 "Safety Inspections" provides a description of CAPE safety inspection procedures. CAPE will conduct safety inspections of its work operations. CAPE anticipates conducting daily jobsite safety inspections and daily equipment inspections during the project. Inspections will be conducted and/or coordinated by the SSHO.

## **7.0 SAFETY AND HEALTH EXPECTATIONS, INCENTIVE PROGRAMS AND COMPLIANCE**

### **7.1 Safety and Health Goals and Objectives**

S&H goals and objectives are to:

- ▲ Familiarize site personnel with the APP and seek their support
- ▲ Provide a safety program that promotes safe working conditions and safe work practices
- ▲ Reduce accidents, incidents, injuries, and illnesses to a minimum
- ▲ Create and reinforce safety conscious attitudes amongst employees
- ▲ Provide a basis for continuing employee safety training
- ▲ Identify persons with authority and responsibility for APP implementation
- ▲ Establish a system for ensuring employee compliance with safe work practices
- ▲ Establish procedures for identifying and evaluating workplace hazards
- ▲ Implement procedures for reporting and investigation of injuries and illnesses
- ▲ Establish procedures for correcting unsafe workplace conditions and unsafe work practices
- ▲ Provide S&H training and instruction for employees.

### **7.2 Measures for Accomplishing Safety and Health Goals and Objectives**

Measures for accomplishing S&H goals and objectives are to:

- ▲ Anticipate, recognize, evaluate, and control potential accident-producing situations through preplanning of S&H considerations into work activities
- ▲ Implement a safety inspection program to identify and correct unsafe work conditions, work practices, and work procedures
- ▲ Train employees to recognize hazards, implement safe work procedures, and use safe work practices
- ▲ Develop and enforce S&H rules and require employees to adhere to these rules as a condition of employment
- ▲ Use engineering and administrative safety controls and supplement with necessary PPE for worker protection
- ▲ Report and investigate accidents promptly to determine cause and take corrective action to prevent recurrence.

### **7.3 Hazard Identification and Evaluation System**

For the project, the SHM and SSHO are responsible for establishing a system for identification and evaluation of workplace hazards. This system includes development of the APP, preparation of AHAs for work activities, and periodic safety inspections of job sites.

#### **7.3.1 Accident Prevention Plan**

Hazard identification and evaluation requirements are primarily accomplished through preparation and implementation of the APP. Project management personnel, SSHO, and the SHM review information relating to project work tasks to be completed; methods to be used; working conditions to be encountered; and chemical, physical and/or biological hazards present. A written site-specific APP is prepared that contains AHAs for primary project work tasks. The APP establishes site-specific safety protocols and contains information to protect employees from potential hazards. The APP is revised whenever additional information becomes available concerning the hazards present at the site and/or should significant changes occur in the scope of work, operational procedures, site hazards, and hazard control measures. This information is reviewed with site personnel at the jobsite before work operations begin. Additional hazards associated with project operations are also identified and evaluated through periodic safety inspections, accident investigations and follow-up, and employee reporting of unsafe or hazardous conditions.

### 7.3.2 Activity Hazard Analyses

AHAs are prepared before beginning each major phase of work (operations involving a type of work presenting hazards not experienced in previous operations or where a new subcontractor or work crew is to perform). The AHA reviews hazards and control measures for primary site tasks. The AHA defines the activities to be performed and identify the sequence of work, specific hazards anticipated, and control measures to be implemented to eliminate or reduce each hazard to an acceptable level. Work does not proceed on that phase of work until the AHA has been accepted by the COR and the AHA has been reviewed with all personnel involved with the activity. The AHA is continuously reviewed and modified when appropriate to address changing site conditions or operations. AHA modification occurs only with the concurrence of the SHM and COR.

## 7.4 Hazard Correction System

An effective hazard correction system must be established for correction of unsafe or unhealthful work conditions, work practices, and work procedures. These corrective measures are required to be completed in a timely manner.

If an imminent hazard is identified, the PM and SSHO are notified immediately. Corrective measures are then taken on an immediate basis to eliminate the hazard. If the imminent hazard cannot be immediately eliminated, personnel are to be removed from the work area and the SSHO will evaluate what safety procedures and corrective actions are to be implemented.

If a nonimminent hazard is identified, the SSHO is notified and corrective actions implemented in a timely manner. Evaluation of the time period allowed for correction of the hazard is at the professional judgment of the SSHO in conjunction with the PM and SHM.

## 7.5 Safety Compliance System

A safety compliance system is established to make sure that employees comply with safe work practices and S&H policies and procedures. The system's effectiveness is highly dependent upon the involvement, direct supervision, and enforcement of safety requirements by supervisory personnel. The system includes:

- ▲ S&H standard operating procedures (SOPs)
- ▲ Safety inspection program
- ▲ Recognition for employees who follow safe work practices
- ▲ Disciplinary actions for unsafe work performance.

### 7.5.1 Standard Operating Procedures

CSHP SOPs and site-specific S&H SOPs are developed and maintained to establish protocol for implementation of various safety programs and requirements. Employee compliance with these procedures is mandatory and is a condition of employment. CSHP SOPs include:

- I. Introduction
- II. Safety Responsibilities
- III. Employee Training
- IV. Safety Meetings
- V. Accident and Injury Investigation Program
- VI. Emergency Action Plan
- VII. Hazard Communication Program
- VIII. Medical Monitoring
- IX. Respiratory Protection Program
- X. Site Safety and Health Plan
- XI. Air Monitoring
- XII. Safety Equipment
- XIII. Confined Space Program

- XIV. Lockout/Tagout Procedure
- XV. Electrical Hazards
- XVI. Fall Protection
- XVII. Ladders and Scaffolding
- XVIII. Excavation
- XIX. Temperature Stress Program
- XX. Bloodborne Pathogens Exposure Control Plan
- XXI. Hearing Conservation Program
- XXII. Fleet Safety
- XXIII. Heavy Equipment/Drill Rig Safety
- XXIV. Water Safety Program
- XXV. Recordkeeping.

#### **7.5.2 Safety Inspections**

The SHM, SSSH, and project supervisors complete safety inspections of project sites and work areas periodically. The SSSH will complete daily safety inspections of work sites to identify and correct hazards. Contractor quality control personnel, as part of their quality control responsibilities, conduct and document daily safety inspections.

The SSSH records identified S&H issues and deficiencies and will indicate the actions, timetable, and responsibility for correction of deficiencies. The SSSH conducts follow-up inspections to correct identified deficiencies and documents these inspections in a like manner.

Safety inspections include work areas, equipment, work practices, and work procedures. Noncompliance items with APP requirements are to be corrected immediately or in a timely manner based on the classification of the hazard as imminent or nonimminent. In the case of unsafe or hazardous machinery, the equipment or area will be "red-tagged" (shut down or evacuated) until the hazard has been corrected. Employees are responsible for inspecting their work areas and equipment for unsafe or hazardous conditions. Employees should correct all unsafe conditions and report them immediately to their supervisor. Maintenance employees must periodically inspect and/or test field equipment for safe and hazard-free operation.

The SHM may also conduct field safety inspections/audits of projects upon the request of the PM. The frequency of these inspections will be at the evaluation of the SHM and PM based on the type of job activities and potential hazards to be encountered on the project.

#### **7.5.3 Disciplinary Action**

CAPE policy requires that employees strictly adhere to established safe work practices and procedures. If employees violate safety procedures or rules, they will be disciplined in accordance with the severity of the infraction. Employees who exhibit unsafe work performance will receive disciplinary action from the PM and SSSH in consultation with the SHM. Disciplinary action can include the following, depending upon the severity of the safety infraction:

- ▲ Verbal warning
- ▲ Written warning notice
- ▲ Termination of employment
- ▲ Other disciplinary action.

Similar disciplinary action is taken for managers and supervisors who fail to follow safety requirements. Additionally, negative ratings for employee performance reviews that affect merit pay increases are also implemented for managers and supervisors.

#### **7.5.4 Safety Recognition**

Safety recognition and safety incentive programs are initiated for specific projects to promote improvement in safety compliance and/or safety performance. Such programs are established by the PM and SSHO in consultation with the SHM.

CAPE implements a safety incentive program for field employees to help emphasize, promote, encourage, and reinforce safe work performance. The primary objectives of the program are to: help communicate the corporate commitment to S&H, focus attention on S&H at the field level, and to recognize, reward, and extend appreciation to those employees who have demonstrated safety consciousness and achieved incident-free work performance. The program is established for selected categories of field employees (hourly operators, laborers, technicians, and operations and maintenance staff). The program is based on a point system with one point having a value of ten dollars being awarded for each week worked. Forty hours of work in a month constitutes eligibility for all the weeks in that month. Points are collected on a quarterly basis and awards issued after the end of the quarterly period. An employee that receives a major safety violation loses eligibility for that quarter. Also, the crew on a project where a major safety violation has occurred loses eligibility for the week in which the incident occurred.

#### **7.6 Safety Communications System**

A system for communication with employees regarding matters related to S&H will be established and will include employee reporting of identified hazards, safety training, daily safety meetings, safety information postings, and written communications.

##### **7.6.1 Employee Reporting of Identified Hazards**

Employees are encouraged and required to inform project supervisors of unsafe or hazardous conditions that are identified. Additionally, employees are encouraged to report observed unsafe work practices by employees, supervisors, or other individuals. Employees may communicate directly with the PM, SSHO, and/or SHM regarding any safety matter. No employee will be disciplined or otherwise discriminated against for reporting or correcting an unsafe condition. Employees may make anonymous reports of unsafe conditions or violations of safety rules to the SSHO or SHM for follow-up action.

##### **7.6.2 Training and Safety Meetings**

Employees receive safety training regarding potential hazards associated with their work assignments. Copies of certificates of S&H training for site personnel is reviewed and maintained by the SSHO. Personnel are not allowed to complete fieldwork requiring specific training until such documentation has been presented to the SSHO.

Site orientation safety meetings, that involve review of pertinent aspects of the APP, are completed for personnel before project fieldwork. Daily safety meetings are conducted for field operations and attendance is documented. Daily safety meetings held by the SSHO at the job site are designed to:

- ▲ Provide instruction regarding hazards specific to each employee's job assignment
- ▲ Act as S&H training program to instill safe and healthful work practices
- ▲ Remind employees that compliance with safe work practices is required
- ▲ Instill a constant sense of safety-consciousness among supervisors and employees
- ▲ Provide opportunity for employees to bring forward concerns and ideas about safety issues
- ▲ Reassure employees to inform supervisors of work site hazards without fear of reprisal.

##### **7.6.3 Safety Information Posting and Written Communications**

Safety posters, articles, notices, and other safety-related information will be posted in an area designated for employee review. These postings may include: safety posters; safety memorandums; safety inspections; incident investigation reports; safety notices and articles; safety training information; and posting of OSHA and labor law postings.

## 8.0 INCIDENT REPORTING

The COR must receive immediate verbal notification and written notification within 24 hours for incidents involving a serious injury, explosion, fire, or a spill/release of toxic materials. Important requirements for incident reporting and follow up are described below.

- ▲ Employees must immediately report all incidents, injuries and illnesses, property damage, liability exposure cases, spills, fires, and serious near miss incidents to their supervisor or the SSHO
- ▲ In the event of a serious incident, supervisors are responsible for notifying the PS and SSHO, who in turn are responsible for notifying the CAPE PM, SHM, Corporate Risk Manager, and Corporate Health and Safety Manager (CHSM). The CHSM should be contacted immediately in injury or illness cases to assist with coordination of required medical assistance and related workers' compensation case management follow up
- ▲ If a serious injury occurs during the project, the SSHO will immediately report the incident to the PM, SHM, COR, and the appropriate government agencies. CAPE will give the COR verbal notification immediately following a lost workday injury, followed by a written notification within 24 hours using ENG FORM 3394, USACE Accident Investigation Report
- ▲ The SSHO and the supervisor(s) responsible for an activity involved in an incident will participate in a complete investigation, and will inspect the area or equipment involved (as applicable). This includes completion and filing of ENG FORM 3394, USACE Accident Investigation Report with the COR; and completion and filing of an "Incident Report by Supervisor," "Incident Statement by Employee," "Incident Statement by Witness," "Injury and Illness Report," "Property Damage, Loss, and General Liability Report," and "Vehicle Accident Report," as applicable, with the SHM within 24 hours of the injury (immediately for a serious injury or fatality)
- ▲ The CHSM and the SHM must be notified immediately of any incident involving hospitalization of three employees or a fatality. The CHSM and the SHM will conduct an immediate investigation. The CHSM and the SHM are responsible for notifying the jurisdictional OSHA office as soon as possible and no later than 8 hours of the accident. (Note: This notification includes weekend days as 24-hour emergency reporting access is available). The CHSM and the SHM will act as the agency interface upon their investigation. The report to OSHA must include: time and date of accident; employer's name, address, and telephone number; name and job title of person reporting the accident; address of the site of the accident; name of person to contact at the site of the accident; name and address of any injured employee(s); nature of injury; location where the injured employee was moved to; list and identity of other law enforcement agencies present at the site of the accident; and description of the accident and whether the accident scene has been altered
- ▲ The SSHO will obtain a doctor's first report of injury for every injury or illness requiring medical treatment and will immediately forward to the CHSM
- ▲ An injured worker is not allowed back to work until a return-to-work notice issued by the treating physician and negative drug and alcohol test documentation (as applicable) are presented to the SSHO. Any injured worker issued a work restriction shall be under the direct supervision of the SSHO and shall be assigned work activities within the restriction until a full duty status clearance has been received
- ▲ The CHSM will make a telephone report for all claims covered under the CAPE Workers' Compensation Policy. Reports are made to the workers' compensation insurance claim-reporting center where an employer's first report of injury or illness form is completed over the phone. After reporting a claim to the reporting center, the information is faxed by the reporting center to the claims service office to handle the claim. Any subsequent medical bills and reports received for the claim are forwarded to the CHSM who will subsequently mail them to the claims service office
- ▲ When a worker returns to work after an injury or illness, the CHSM will contact the claims servicing office to advise them of the actual date of return to work. Questions or inquiries are to be directed to the CHSM who will contact the claims service office or the CAPE insurance company, as needed
- ▲ The CHSM records each injury or illness on the OSHA Form No. 300 "Log of Work Related Injuries and Illnesses" and the OSHA Form 300A "Summary of Work-Related Injuries and Illnesses." The OSHA 300

form is posted annually no later than February 1 (of the following year) and is kept posted for three months (until April 30)

- ▲ During the project, CAPE will provide project hours worked and project incidence rates to the COR on a monthly basis. Accident investigation reports and an updated project OSHA 300 log will be provided to the COR should an injury occur.

## **9.0 MEDICAL SUPPORT**

### **9.1 Onsite Medical Support**

A minimum of two first aid/CPR-trained workers is required to be present on site during work. The names of the qualified first-aid/CPR personnel will be reviewed with site personnel and posted in the project office.

### **9.2 Offsite Medical Support**

CAPE uses WorkCare, Inc. to provide occupational physician support services. WorkCare physicians are Board-Certified (or Board-Eligible) and provide medical director services to CAPE. WorkCare contact information is provided on the Emergency Contact List (see Attachment 1 of the SSHP).

## **10.0 PERSONAL PROTECTIVE EQUIPMENT**

SSHP Section 6 "Personal Protective Equipment" reviews CAPE PPE descriptions and project requirements. PPE will be required for certain field operations based on the potential for site hazards. The SSHO and SHM will establish appropriate levels of protection for each work activity based on review of site information, existing contaminant data, and evaluation of the potential for exposure. The SSHO and SHM will establish action levels for upgrade or downgrade in the initial minimum levels of protection.

A description of the EPA levels of protection system and associated PPE is described in the SSHP. It is anticipated that use of Level C, Modified Level D, and Level D protection will be required for project activities. No Level A or B protection work is expected.

## **11.0 PLANS REQUIRED BY THE SAFETY MANUAL**

The plans (i.e., programs, procedures) that are required by EM 385-1-1 (as applicable) and the corresponding reference to the section in the manual are listed below with the reference to the corresponding section of EM 385-1-1 indicated. Plans that are applicable to project work are reviewed below.

- ▲ Layout plans for temporary structures (04.A.01)
- ▲ Emergency response plan: Procedures and tests (01.E.01)
- ▲ Emergency response plan: Spill plans (01.E.01, 06.A.02)
- ▲ Emergency response plan: Firefighting plan (01.E.01, 19.A.04)
- ▲ Emergency response plan: Posting of emergency telephone numbers (01.E.05)
- ▲ Hazard communication program (01.B.06)
- ▲ Respiratory protection program (05.E.03)
- ▲ Health hazard control program (06.A.02)
- ▲ Contingency plan for severe weather (19.A.03)
- ▲ SSHP (28.A.02)
- ▲ Alcohol and drug abuse prevention plan (DFARS Subpart 252.223-7004)
- ▲ Site sanitation plan (Section 02)
- ▲ Fire prevention plan (09.A.01).

### **11.1 Layout Plans for Temporary Structures**

A layout plan will be submitted to show the layout plan for temporary structures (i.e., office trailer).

## **11.2 Emergency Response Plan: Procedures and Tests**

SSHP Section 9 "Emergency Response Plan" details CAPE project emergency response plans. Emergency procedures and tests including: emergency services and personnel, emergency supplies, site and emergency communications, emergency hospital and route information, medical emergency incident response, fire or explosion incident response, chemical spill incident response, and incident reporting to the COR are reviewed.

## **11.3 Emergency Response Plan: Spill Plans**

SSHP Section 9.5 "Response to Chemical Spill Incident" reviews CAPE plans to respond to chemical spill emergencies.

## **11.4 Emergency Response Plan: Firefighting Plan**

SSHP Section 9.4 "Response to Fire Incident" reviews CAPE plans to respond to fire emergencies.

## **11.5 Emergency Response Plan: Posting of Emergency Telephone Numbers**

SSHP Section 9.1 "Site and Emergency Communications" reviews CAPE requirements for posting of emergency telephone numbers, emergency hospital information, and the emergency hospital route. An Emergency Contact List, including Emergency Hospital and Route information, is included in Attachment 1 of the SSHP.

## **11.6 Emergency Response Plan: Wild Land Fire Prevention Plan**

Not applicable.

## **11.7 Emergency Response Plan: Man Overboard/Abandon Ship**

Not applicable.

## **11.8 Hazard Communication Program**

SSHP Section 8.2.2 "Hazard Communication" reviews CAPE hazard communication procedures. The CAPE "Hazard Communication Program" SOP shall be referred to for guidance and requirements. The SSHP will maintain a hazardous substance inventory list and copies of MSDSs for hazardous substances to be used during project work. Site personnel will be informed of the hazardous substances they will be working with through APP review and attendance at daily safety meetings.

## **11.9 Respiratory Protection Plan**

SSHP Section 6.3 "Respiratory Protection" reviews CAPE respiratory protection requirements. The CAPE "Respiratory Protection Program" SOP shall be referred to for guidance and requirements.

## **11.10 Health Hazard Control Program**

Health hazard controls are integrated in the AHAs for the project.

## **11.11 Lead Abatement Plan**

Not applicable.

## **11.12 Asbestos Abatement Plan**

Not applicable.

## **11.13 Abrasive Blasting**

Not applicable.

**11.14 Confined Space Plan**

Not applicable.

**11.15 Hazardous Energy Control Plan**

SSHP Section 3.2.8 "Electrical Equipment and Lockout/Tagout" reviews CAPE electrical equipment safety and lockout/tagout procedures for control of hazardous energy. The CAPE "Lockout/Tagout Program" SOP shall be referred to for guidance and requirements.

**11.16 Critical Lift Procedures**

Not applicable.

**11.17 Contingency Plan for Severe Weather**

SSHP Section 3.2.16 "Inclement Weather and Adverse Environmental Conditions" reviews CAPE contingency plans for severe weather. Safety procedures for cases of inclement weather or other adverse environmental conditions (i.e., strong winds, rain, freezing, lightning, hurricane, tornado, and earthquake) are reviewed.

**11.18 Access and Haul Road Plan**

Not applicable.

**11.19 Demolition Plan: Engineering and Asbestos Surveys**

Not applicable.

**11.20 Emergency Rescue: Tunneling**

Not applicable.

**11.21 Underground Construction Fire Prevention and Protection Plan**

Not applicable.

**11.22 Compressed Air Plan**

Not applicable.

**11.23 Formwork and Shoring Erection and Removal Plan**

Not applicable.

**11.24 Jacking Plan**

Not applicable.

**11.25 Site Safety and Health Plan**

A detailed SSHP has been prepared for this project (see Attachment C)

**11.26 Blasting Plan**

Not applicable.

**11.27 Diving Plan**

Not applicable.

#### **11.28 Alcohol and Drug Abuse Prevention Plan**

SSHP Section 11.2 "Drug and Alcohol Testing Program" reviews CAPE alcohol and drug abuse information. CAPE has a substance abuse policy that establishes requirements for a drug-free workplace and pre-employment drug testing. CAPE requires that post-accident drug and/or alcohol testing be conducted when employees have caused or contributed to an on-the-job injury resulting in loss of work time or damage to property.

#### **11.29 Fall Protection Plan**

Not applicable.

#### **11.30 Steel Erection Plan**

Not applicable.

#### **11.31 Night Operations Lighting Plan**

Not applicable.

#### **11.32 Site Sanitation Plan**

SSHP Section 8.2.6 "Sanitation" reviews CAPE sanitation procedures.

#### **11.33 Fire Prevention Plan**

SSHP Section 3.2.1 "Fire Protection" reviews CAPE fire prevention procedures. Procedures for fire hazards, fire protection, and hot work are reviewed. Emergency fire procedures are also reviewed in the emergency response plan section of the SSHP.

### **12.0 CONTRACTOR INFORMATION AND SITE SPECIFIC HAZARDS AND CONTROLS**

SSHP Section 3.0 "Site Hazards" reviews anticipated site hazards and safety control measures for chemical, physical, and biological hazards.

#### **12.1 Chemical Hazards**

SSHP Section 3.1 "Chemical Hazards" reviews chemical hazards anticipated for project fieldwork. Potential contaminants of concern that may be encountered during project fieldwork are:

- ▲ Polychlorinated biphenyls.

Chemical substances with anticipated use during site work include:

- ▲ Fuels: Diesel and gasoline fuel for vehicles and equipment
- ▲ Lubricants: Oil, grease, antifreeze, and other lubricants for vehicles and equipment
- ▲ Fire extinguishing agent: Dry chemical for fire extinguishers
- ▲ Decontamination solutions: Decontamination solution for sampling equipment
- ▲ Paint: Spray paint for marking of locations.

#### **12.2 Physical Hazards**

SSHP Section 3.2 "Physical Hazards" lists and reviews the primary physical hazards anticipated for site work.

- ▲ Fire protection
- ▲ Underground and overhead utilities
- ▲ Heavy equipment operation
- ▲ Excavation and trench safety

- ▲ Vehicle and equipment traffic control
- ▲ Material handling
- ▲ Tools, machinery, and equipment use
- ▲ Electrical equipment and lockout/tagout
- ▲ Noise exposure
- ▲ Heat stress
- ▲ Cold stress
- ▲ Pressure washer operation
- ▲ Chain saw operation
- ▲ Tree removal operations
- ▲ Wood chipper operation
- ▲ Inclement weather and other adverse environmental conditions
- ▲ Miscellaneous physical hazards.

### 12.3 **Biological Hazards**

SSHP Section 3.3 "Biological Hazards" lists and reviews biological hazards that may potentially be encountered during site work.

- ▲ Poisonous plants
- ▲ Poisonous snakes
- ▲ Poisonous spiders
- ▲ Rodents
- ▲ Ants and bees
- ▲ Ticks
- ▲ Mosquitoes.

### 12.4 **Activity Hazard Analyses**

Activity Hazard Analyses have been prepared for the following primary site tasks and are provided in Attachment 3 of the SSHP.

- ▲ Mobilization and site preparation
- ▲ Soil excavation, transportation and disposal
- ▲ Sampling and analysis
- ▲ Site restoration and demobilization.

**ATTACHMENT A**  
**ACCIDENT PREVENTION PLAN REVIEW FORM**

## CAPE

### ACCIDENT PREVENTION PLAN REVIEW

I have reviewed the CAPE Accident Prevention Plan for the above indicated site and understand the hazards and control measures required on this project.

I agree to follow the procedures outlined in this plan and to inform the CAPE Project Manager and/or Site Safety and Health Officer should any unsafe condition be noted.

I understand that failure to follow safety regulations can be reason for removal from this project.

Date	Name	Signature	Company

Revised 5/05

**ATTACHMENT B**  
**RESUMES FOR SHM AND SSHO**

## **GLEN MAYEKAWA, CIH**

### **SAFETY AND HEALTH MANAGER**

#### **PROFESSIONAL QUALIFICATIONS**

A Certified Industrial Hygienist (CIH) with a graduate degree in Environmental and Occupational Health and more than 20 years of experience in the comprehensive practice of occupational safety and health (S&H).

#### **EDUCATION**

- ▲ MS, Environmental and Occupational Health, California State University, Northridge, CA, 1979
- ▲ BS, Environmental and Occupational Health, California State University, Northridge, CA, 1977.

#### **CERTIFICATIONS AND TRAINING**

- ▲ Certified Industrial Hygienist, Comprehensive Practice, American Board of Industrial Hygiene, #5780
- ▲ Certified Lead Construction Inspector/Assessor, Project Monitor, and Project Designer, CA DHS, #1549
- ▲ Certified Asbestos Consultant, Cal-OSHA, #93-1007
- ▲ AHERA Asbestos Contractor/Supervisor; Building Inspector and Management Planner
- ▲ 40-Hour HazWOPER worker training (1989)
- ▲ 8-Hour HazWOPER manager and supervisor training (1989, 1997)
- ▲ 8-Hour HazWOPER refresher training (2004)
- ▲ OSHA 500 Construction S&H Trainer Course (2002)
- ▲ First-aid (2003) and CPR training (2005)
- ▲ Excavation safety training (1993)
- ▲ Confined space training (1999).

#### **EXPERIENCE AND BACKGROUND**

- ▲ Provided technical assistance and S&H support for construction and hazardous waste projects.
- ▲ Directed and supervised project Site Safety and Health Officers (SSHOs)
- ▲ Prepared Site Safety and Health Plans (SSHPs) for hazardous waste site operations
- ▲ Functioned as SSHO for a wide range of construction and hazardous waste projects
- ▲ Supervised confined space entry, excavation, and emergency response operations
- ▲ Involved in multiple AST/UST removal and demolition operations
- ▲ Experienced and certified in multiple disciplines for asbestos and lead management
- ▲ Conducted daily safety meetings and monthly supervisor safety meetings
- ▲ Performed safety inspections and audits of site activities
- ▲ Conducted incident investigations and completed follow up documentation
- ▲ Established required levels of protection for site personnel for site activities
- ▲ Performed calibration and maintenance of air monitoring instruments
- ▲ Conducted worker exposure monitoring for chemical and physical agents
- ▲ Instructed S&H training for hazardous waste operations, respiratory protection, PPE, HazCom, etc.
- ▲ Developed S&H standard operating procedures (SOPs)
- ▲ Served as Radiation Safety Officer for state radioactive material license
- ▲ Managed company medical surveillance and OSHA recordkeeping programs
- ▲ Coordinated injury and illness management program and other safety programs.

#### **EMPLOYMENT HISTORY**

CAPE: Corporate Health and Safety Manager (2002-present); Regional Safety Manager (2000-2002)  
CET Environmental: Corporate Health and Safety Manager (1995-2000); Senior Industrial Hygienist (1993-1995)  
Jacobs Engineering Group: Health and Safety Manager (1994-1995)  
EnviroHealth, Inc.: Senior Industrial Hygienist (1989-1993)  
IT Corporation: Regional Health and Safety Manager (1983-1989); Health and Safety Coordinator (1979-1983).

## **Eric Lynch**

### **Project Manager**

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**Why Selected?** 13 years of experience working for federal clients ❖ Specific experience includes working for USACE ❖ Develops technical reports and work plans for the DOD ❖ Certified by USACE Contractor Quality for Control ❖ Provides cost estimates (MCACES and "Success"), abatement specifications, inspections and management plans asbestos, lead & other industrial hygiene matters

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#### **Education**

- ❖ BS, Industrial Technology, University of Maryland, 1988

#### **Certifications/Specialized Training**

- ❖ USACE Contractor Quality Control (CQC) Certified
- ❖ EPA/AHERA Accredited Asbestos Building Inspector and Project Designer
- ❖ NIOSH 582 Equivalent Sampling and Evaluating Airborne Asbestos Dust; Asbestos Analyst Registry
- ❖ 40-Hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HazWOPER) Training, 1999
- ❖ 8-Hour HazWOPER Supervisor Training, 2001
- ❖ 8-Hour HazWOPER Refresher Training, 2003
- ❖ EPA Lead Inspector
- ❖ EPA Lead Hazard Risk Assessor
- ❖ EPA Lead Abatement Supervisor
- ❖ EPA Lead Project Designer
- ❖ USACE Construction Quality Management for Contractors Training Course
- ❖ First-Aid/Cardiopulmonary Resuscitation (CPR) Training, American red Cross (ARC), 2003
- ❖ Air-Powered Respirator (APR) Fit Test, 2003

#### **Summary of Experience**

Eric's primary experience has been providing environmental management services to public and private sector clients. He has been responsible for providing cost estimates (MCACES and "Success"), abatement specifications, inspections and management plans asbestos, lead and other industrial hygiene matters for more than 12 years. Eric has managed industrial hygiene, environmental audit and site assessment projects for more than 10 years.

#### **Experience**

**1997–present**

**CAPE Environmental Management Inc**

##### **Project Manager**

**Site Safety and Health Officer (SSHO), U.S. Army Corps of Engineers (USACE) Kansas City District, Pre-Placed Remedial Action Contract (PRAC), Federal Creosote Site, Manville, NJ (Oct 00-Jan 02).** Two abatement/demolition projects. Responsible for implementation of Site Safety and Health Plan (SSHP). Responsibilities included on site supervision of asbestos abatement before the demolition of buildings, capping utilities, and removal of landscaping. CAPE was responsible for the removal and disposal of all asbestos-containing materials (ACM). Conducted all S&H training including fit testing on site. Conducted daily "tailgate" safety meetings before starting work to identify specific hazards that might be encountered each day. Work was done in a densely populated residential area. CAPE had up to 25 employees and subcontractors on site at a time and with no S&H incidents at either task order (TO).

**Quality Control (QC) Coordinator, USACE Philadelphia District, Rabbit Run Channel Reconstruction, Lipari Landfill, Pitman, NJ (Oct 02-Apr 03).** Soil remediation/drainage channel reconstruction. Responsibilities in-

cluded onsite CQC of project processes including site preparation, excavation, liner installation, and site restoration. CAPE developed Remedial Action Work Plan, Erosion and Sedimentation Control Plan, Waste Management Plan, SSHP, project specs, and design drawings.

**SSHO, AFCEE, Andrews AFB (2000-present).** Various TOs involving HTRW remediations. Ensured SSHP is followed on site. TOs included pipe abandonment, emergency fuel spill cleanup, valve replacement, and tank cleaning.

**TO Manager, USACE Kansas City District, Bog Creek Farm Superfund Site, Howell, NJ (Sep 01-current).** Groundwater extraction and treatment plant. Responsibilities included preventative and corrective maintenance scheduling, staffing for plant operations, and subcontracting.

**SSHO, United States Department of Agriculture, South Building Modernization Subcontract.** Comprehensive asbestos, LBP, and PCB management services for the Modernization of the Department of Agriculture, South Building.

**SSHO and Estimator, Atlantic Division - NAVFACENGCOM - \$3M A/E IQ Contract.** Duties included providing cost estimates (MCACES) for the abatement of asbestos and lead at facilities in NC, VA, and Puerto Rico.

**SSHO and Estimator, United States Postal Service (USPS), \$2.5 M A/E IQ Contract.** Duties included developing cost estimates for asbestos, and lead projects at Postal Facilities throughout MD, DE, PA, NY, and NJ. Assisted and developed a recycling plan for various postal facilities throughout the region.

**SSHO and Estimator, General Services Administration (GSA), \$3M A/E IQ Contract.** Duties included developing cost estimates for asbestos, lead, PCB, and UST remediation projects at Federal Facilities throughout MD, DE, VA, PA, NY, and NJ. This included a \$1M asbestos abatement project at the Fallon Federal Building in Baltimore, MD. CAPE's cost estimate included air monitoring, construction oversight, coordination of trades, and construction cost.

**Project Lead, Southern Division, NAVFACENGCOM - Naval Air Station, Key West.** Duties included asbestos building surveys and LBP pre-demolition surveys at various facilities.

**Project Lead, Delaware Renaissance Society, Wilmington, DE.** Asbestos and lead investigations for the renovation and perseverance of architectural and historical buildings.

**Project Manager, University of Delaware, Newark, DE.** Provided comprehensive asbestos services, including survey, assessment, cost estimates, preparation of specifications, daily air monitoring, and construction administration for asbestos remediation projects. Specific work included continuous air monitoring of temperature, relative humidity, carbon dioxide (CO<sub>2</sub>), carbon monoxide (CO), and particulates using direct reading instruments and air sample collection and analysis of the following: volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), welding/cutting metals, fiberglass, bacteria, and fungus. The inspection services included conducting periodic inspections and interviews within the work area and area adjacent. CAPE used the "IAQ Guidelines for Occupied Buildings Under Construction" published by the Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA) as a guidance document to plan and execute the IAQ monitoring and evaluation of air pressure relationships using smoke to identify potential pollutant pathways and the effectiveness of the control measures.

**Project Manager, Dover Air Force Base, Dover, DE.** Responsible for managing asbestos building inspections and lead based paint surveys of various facilities, specification design and monitoring for the abatement of painted wall surfaces. CAPE was contracted by EA Engineering, Science & Technology to conduct a non-invasive/non-destructive asbestos-containing material and lead-based paint survey at the Dover Air Force Base.

**Star Enterprise, Delaware City Refinery, Location.** Industrial hygiene sampling and OSHA employee monitoring for asbestos, lead, silica, vanadium, and zinc during Unit #4 heat box shutdown and retrofit.

**MBNA America, Inc, Newark, DE.** Asbestos survey, inspection design, and abatement monitoring.

**Maryland-Eastern Shore Consortium, MD.** Term contract for asbestos, lead, and industrial hygiene consulting for nine eastern shore county public schools and educational departments including building surveys, specification designs, abatement monitoring, AHERA three-year re-inspections, and six month periodic surveillance.

**1992-1997**

**Environmental Testing, Inc.**

**Project Manager**

**1992-1997**

**Batta Environmental Associates**

**Project Lead**

**1989-1990**

**Phillip DuPont Optical**

**Researcher for optical storage disks**

### **Regulatory Experience**

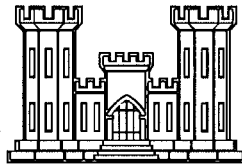
Eric has extensive experience with regulatory agencies within Region II, specifically in PA, NJ, NY, CT, MA, MD, DC, WV, VA, NC, and Puerto Rico. His experience is associated with RCRA, CERCLA, and OSHA regulations.

**ATTACHMENT C**  
**SITE SAFETY AND HEALTH PLAN**

**SITE SAFETY AND HEALTH PLAN**  
**REMEDIAL DESIGN**  
**FINAL**  
**OPERABLE UNIT 1**  
**CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE**  
**SOUTH PLAINFIELD, NEW JERSEY**

**Contract Number W912DQ-05-D-0001**  
**Task Order Number 001**

*Prepared for:*



**DEPARTMENT OF THE ARMY**  
**KANSAS CITY DISTRICT**  
**CORPS OF ENGINEERS**  
**700 Federal Building**  
**Kansas City, Missouri 64106-2896**

*Prepared by:*



**CAPE**  
**180 Gordon Drive, Suite 102**  
**Exton, Pennsylvania 19341**

**CAPE Project Number 50001.001**  
**October 2005**

**FINAL  
SITE SAFETY AND HEALTH PLAN**

**CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE SOUTH PLAINFIELD,  
NEW JERSEY**

**Contract Number W912DQ-05-D-0001**

**Task Order 001**

**October 2005**

The following Plan has been prepared in response to a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Record of Decision (ROD) and the signatories below have reviewed and approved the plan for compliance with project requirements.



10/26/05

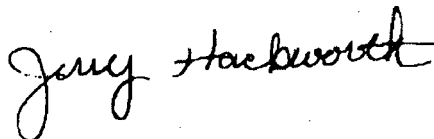
Approved by: \_\_\_\_\_

Michael Lamon

Cape Environmental

Project Manager

Date



1/27/06

Approved by: \_\_\_\_\_

Jerry Hackworth

Cape Environmental

Site Superintendent

Date



1/27/06

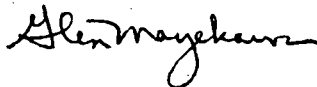
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Site Safety and Health Officer

Date



10/26/05

Approved by: \_\_\_\_\_

Glen Mayekawa, CIH

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Safety and Health Manager

Date

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- 2 Physical Hazard Information
- 3 Exposure Monitoring Plan

### FIGURES

- 1 Site Vicinity Map
- 2 Emergency Hospital Route Map
- 3 Site Layout Map

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- 1 Emergency Contact List and Emergency Hospital Route
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- 2 Site Safety and Health Plan Forms
  - ▲ Accident Prevention Plan Review
  - ▲ Activity Hazard Analysis Preparatory Phase Training Log
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- ▲ USACE Accident Investigation Report (ENG FORM 3394)
- ▲ Vehicle Accident Report

### 3 Activity Hazard Analyses

Mobilization and site preparation  
Soil excavation, transportation and disposal  
Sampling and analysis  
Site restoration and demobilization

### 4 Community Ambient Air Monitoring Plan

## LIST OF ABBREVIATIONS AND ACRONYMS

$\mu\text{m}$	micrometer
ACGIH	American Conference of Governmental Industrial Hygienists
AHA	activity hazard analysis
AIHA	American Industrial Hygiene Association
APP	Accident Prevention Plan
APR	air-purifying respirator
bpm	beats per minute
CDE	Cornell-Dubilier Electronics
CFR	Code of Federal Regulations
CHSM	Corporate Safety and Health Manager
CIH	Certified Industrial Hygienist
COR	Contracting Officer's Representative
CPR	cardiopulmonary resuscitation
CRZ	contamination reduction zone
dBA	decibels on the a-weighted scale
DOT	U.S. Department of Transportation
EM 385-1-1	USACE Safety and Health Requirements Manual EM 385-1-1
EPA	U.S. Environmental Protection Agency
EZ	exclusion zone
GC/ECD	gas chromatography/electron capture detector
GFCI	ground fault circuit interrupter
HazWOPER	Hazardous Waste Operations and Emergency Response
HEPA	high-efficiency particulate air
HR	heart rate
LEL	lower explosive limit
LPM	liters per minute
mg/kg	milligrams per kilogram
mg/m <sup>3</sup>	milligrams per cubic meter
mm	millimeter
MSDS	Material Safety Data Sheet
NIOSH	National Institute for Occupational Safety and Health
°F	degrees Fahrenheit
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PCB	polychlorinated biphenyl
PEL	permissible exposure limit
PM	Project Manager

PNOS	particles not otherwise specified
POC	Point of Contact
PPE	Personal Protective Equipment
PVC	polyvinyl chloride
ROD	Record of Decision
S&H	Safety and Health
SCBA	Self-Contained Breathing Apparatus
SHM	Safety and Health Manager
SOP	Standard Operating Procedure
SOW	Statement of Work
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
STEL	Short-Term Exposure Limit
TLV	ACGIH Threshold Limit Value
TWA	time-weighted average
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound

## 1.0 BACKGROUND

This Site Safety and Health Plan (SSHP) presents the contractor safety and health (S&H) procedures to be implemented by CAPE for services associated with the U.S. Army Corps of Engineers (USACE), Cornell-Dubilier Electronics (CDE) Superfund Site Operable Unit (OU) 1 Phase A Remedial Action, South Plainfield, New Jersey project. CAPE project work will be conducted under a contract with the USACE Kansas City District.

The purpose of the SSHP is to identify and evaluate S&H hazards at the project worksite and to prescribe safety control measures to be implemented. The SSHP is implemented in conjunction with the project Accident Prevention Plan (APP) and CAPE S&H policies and procedures. This SSHP has been prepared to meet the requirements of: Occupational Safety and Health Administration (OSHA) standards, 29 Code of Federal Regulations (CFR) Part 1910 and 29 CFR Part 1926, including the "Hazardous Waste Operations and Emergency Response" regulation (29 CFR 1910.120; 29 CFR 1926.65); USACE *Safety and Health Requirements Manual* (EM 385-1-1); and the Department of the Army, Kansas City District, Corps of Engineers Statement of Work (SOW) dated 8 March 2005.

This SSHP will serve as the primary S&H guidance for work on the project. This SSHP:

- ▲ Provides background information related to the project
- ▲ Assigns responsibilities for SSHP implementation
- ▲ Identifies site hazards and hazard control measures
- ▲ Describes the exposure monitoring program
- ▲ Establishes requirements for site control and personal protective equipment (PPE)
- ▲ Discusses standard safety procedures and designates emergency response plans
- ▲ Reviews training, medical surveillance, and recordkeeping programs to be implemented at the site.

The CAPE Project Manager (PM), Site Superintendent, Site Safety and Health Officer (SSHO), and Safety and Health Manager (SHM) implement the SSHP in coordination with the USACE Contracting Officer's Representative (COR) and U.S. Environmental Protection Agency (EPA) Point of Contact (POC). Project personnel performing in these functions are indicated on the Emergency Contact List (see Attachment 1).

Compliance with the SSHP is required of all CAPE personnel, subcontractors, and associated third parties on site. A copy of the SSHP will be maintained on site during work activities and will be available for inspection and review by site or agency personnel. Field personnel will review applicable aspects of the SSHP before site work and will sign a "SSHP Review" acknowledgment form (see Attachment 2) indicating that they have reviewed the pertinent aspects of the plan and will sign a "Certificate of Worker/Visitor Acknowledgment" form indicating that they acknowledge meeting required medical, training, and S&H requirements for site entry. Site personnel will review the applicable Activity Hazard Analyses (see Attachment 3) associated with a project activity before initiating that activity. Review will be documented on the "Activity Hazard Analysis Preparatory Phase Training Log" maintained by the SSHO. Site personnel will review the Accident Prevention Plan before site work and will document their review on an "Accident Prevention Plan Review" form.

The contents of the SSHP may be revised or amended if additional information becomes available regarding the hazards present at the site or if significant changes occur in the SOW, operational procedures, site hazards, or hazard control measures. The SSHP may be modified by the SSHO upon review and approval of the COR, PM, and SHM. Field personnel are informed of changes to the SSHP through safety meetings and written addenda or revisions to the SSHP.

### 1.1 Site Location and Background

The CDE site is located at 333 Hamilton Boulevard, South Plainfield, Middlesex County, New Jersey (see Figure 1 for a site vicinity map and Figure 2 for an emergency hospital route map).

The former CDE facility, now known as the Hamilton Industrial Park, consists of approximately 26 acres containing 18 buildings that are currently used by a variety of commercial and industrial tenants. The CDE site is on the National Priorities List due to polychlorinated biphenyl (PCB) contamination found in soil and buildings. This project task order focuses on OU-1 PCB-contaminated soils and properties in the vicinity of the former CDE facility.

Before 1936, Spicer Manufacturing Corp., a predecessor to Dana Corporation, owned and operated the facility, and many of the buildings date from this era. Spicer Manufacturing Corp. ceased operations in South Plainfield in 1929 and, beginning in 1936, leased the property to CDE. CDE operated in South Plainfield from 1936 to 1962, manufacturing electronics components including, in particular, capacitors. PCBs and chlorinated organic solvents were used in the manufacturing process, and the company apparently disposed of PCB-contaminated materials and other hazardous substances directly on the facility soils. CDE's activities evidently led to widespread chemical contamination at the facility, as well as migration of contaminants to areas adjacent to the facility. PCBs have been detected in the groundwater, soils, and in building interiors at the industrial park, at adjacent residential, commercial, and municipal properties, and in the surface water and sediments of the Bound Brook. High levels of volatile organic compounds (VOCs) have been found in the facility soils and in groundwater. Since CDE's departure from the facility in 1962, it has been operated as a rental property, with more than 100 commercial and industrial companies operating at the facility as tenants.

The EPA has divided the site into separate phases, or OUs, for remediation purposes. OU-1 consists of residential, commercial, and municipal properties located in the vicinity of the former CDE facility. OU-2 addresses the former CDE facility, consisting of contaminated facility soils and buildings at the former CDE facility, including soils that may act as a source of groundwater contamination. Additional OUs will address contaminated groundwater and the sediments of the Bound Brook.

## 1.2 Scope of Work

Project work shall be performed design, plan, and perform excavation and offsite disposal of contaminated soil; restoration of properties to pre-excavation conditions; sampling and analysis of soil, air, and interior building dust; review and compile existing right-of-way and study area data; and other activities as necessary to support EPA Region 2 in achieving the remedial goals set forth in the CDE Superfund Site Record of Decision (ROD) for OU-1 (September 2003).

Project activities involve the excavation; transportation and disposal; sampling and analysis; and site restoration activities associated with the excavation of approximately 750 cubic yards of PCB-contaminated soil from four vicinity properties designated as OU-1, Phase A. Properties designated as OU-1, Phase A, include:

*Addresses redacted*

## 1.3 CAPE Project Fieldwork Activities

For the purposes of this plan, CAPE has organized the project into primary fieldwork activities that are listed and described below:

Mobilization and site preparation  
Soil excavation, transportation and disposal  
Sampling and analysis  
Site restoration and demobilization.

### 1.3.1 Mobilization and Site Preparation

Mobilization and site preparation involves the mobilization of personnel and equipment and preparation of the site for the fieldwork activities. Main tasks for this activity are listed below:

- ▲ Mobilize personnel, equipment and supplies to the site
- ▲ Conduct safety orientation briefing and SSHP review
- ▲ Receive and inspect heavy equipment
- ▲ Place stone to improve the laydown and site support areas
- ▲ Set up office trailers and support utilities

- ▲ Arrange for sanitary facilities and potable water supplies
- ▲ Install chain link fence around project office compound
- ▲ Perform utility clearance
- ▲ Delineate work zones and establish decontamination stations
- ▲ Conduct clearing and grubbing
- ▲ Install project signs and construction fence
- ▲ Install erosion controls
- ▲ Perform other site preparation tasks.

### **1.3.2 Soil Excavation, Transportation, and Disposal**

Soil excavation, transportation and disposal involves the excavation of approximately 750 cubic yards of PCB-contaminated soil from four vicinity properties designated as OU-1, Phase A. Main tasks for this activity are listed below:

- ▲ Review utility clearance
- ▲ Delineate excavation areas
- ▲ Establish haul routes
- ▲ Implement dust control measures
- ▲ Excavate contaminated soil from four designated properties
- ▲ Load contaminated soil into dump trucks
- ▲ Transport contaminated soil for disposal.

### **1.3.3 Sampling and Analysis**

Sampling and analysis involves the collection of air, soil, and dust samples for analysis. Main tasks for this activity are listed below:

- ▲ Calibrate air monitoring equipment daily
- ▲ Set up perimeter air monitoring stations at each property location
- ▲ Collect PCB air samples at perimeter locations during excavation of contaminated soil at each property
- ▲ Collect soil samples from designated Phase B properties for preremediation PCB investigation
- ▲ Use field screening kit methods for open excavation and postexcavation soil sampling
- ▲ Collect/Analyze confirmation soil samples during excavation for PCBs
- ▲ Perform interior dust sampling of homes and commercial buildings designated by the EPA.

### **1.3.4 Site Restoration and Demobilization**

Site restoration and demobilization involves restoration of the site back to pre-remedial conditions and to demobilize personnel and equipment from the site. Main tasks for this activity are listed below:

- ▲ Backfill excavations with clean fill and topsoil
- ▲ Grade and compact soil
- ▲ Place sod
- ▲ Install trees and shrub plantings
- ▲ Replace or rebuild structures (i.e., fences) that were removed for excavation
- ▲ Decontaminated equipment
- ▲ Demobilize personnel and equipment from the site.

## **2.0 PROJECT ORGANIZATION**

This section of the SSHP provides information on project personnel, and a description of CAPE personnel S&H responsibilities.

## **2.1 Key Project Personnel**

Key project personnel are identified in the project "Emergency Contact List" (Attachment 1). Listed personnel include those individuals serving in the following functions:

- ▲ COR (USACE)
- ▲ POC (EPA)
- ▲ PM (CAPE)
- ▲ Site Superintendent (CAPE)
- ▲ SSHO (CAPE)
- ▲ SHM (CAPE).

## **2.2 CAPE Personnel Health and Safety Responsibilities**

### **2.2.1 Project Manager**

The PM is responsible for overall direction, coordination, technical consistency, and review of the task order project. PM S&H responsibilities are listed below:

- ▲ Direct, coordinate, and implement the project task order
- ▲ Review and approve the site-specific SSHP
- ▲ Emphasize the importance of safety and hold personnel accountable for safe work performance
- ▲ Enforce implementation and compliance with the SSHP and S&H procedures
- ▲ Provide resources and support to the Site Superintendent and SSHO for effective completion of duties
- ▲ Monitor and evaluate S&H performance of project operations
- ▲ Communicate with the COR to evaluate and resolve S&H issues.

### **2.2.2 Site Superintendent**

The Site Superintendent is charged with the overall responsibility for the successful completion of CAPE field operations. Site Superintendent S&H responsibilities are listed below:

- ▲ Prepare and organize project activities on site
- ▲ Review and approve the site-specific SSHP
- ▲ Provide equipment and materials for project operations
- ▲ Emphasize the importance of safety and hold personnel accountable for safe work performance
- ▲ Enforce implementation and compliance with the SSHP and S&H procedures
- ▲ Ensure immediate correction of unsafe work conditions and/or unsafe work practices
- ▲ Monitor and evaluate S&H performance of project operations
- ▲ Communicate with the COR to evaluate and resolve S&H issues.

### **2.2.3 Site Safety and Health Officer**

The SSHO is the onsite project SHM. The SSHO is present during fieldwork activities. If he must be absent from the site, the S&H duties must be delegated to another responsible party at the site. SSHO S&H responsibilities are listed below:

- ▲ Review and approve the site-specific SSHP
- ▲ Maintain copies of the SSHP on site during field activities
- ▲ Implement provisions of the SSHP, CAPE S&H Program, and USACE EM 385-1-1
- ▲ Require that site personnel meet training, medical surveillance, and field experience requirements
- ▲ Conduct site orientation training, SSHP review, and daily safety meetings
- ▲ Emphasize the importance of safety and hold personnel accountable for safe work performance
- ▲ Review site hazards and establish S&H control measures
- ▲ Maintain a hazardous substance inventory list and copies of material safety data sheets (MSDSs)
- ▲ Maintain safety equipment and supplies
- ▲ Perform inspections for safe work operations
- ▲ Enforce implementation and compliance with the SSHP and S&H procedures

- ▲ Establish site control work zones and boundaries
- ▲ Determine PPE requirements and monitor proper use
- ▲ Direct decontamination procedures to be used
- ▲ Perform and/or coordinate site exposure monitoring
- ▲ Report safety violations or S&H concerns promptly to the PM
- ▲ Ensure immediate correction of unsafe work conditions and/or unsafe work practices
- ▲ Monitor and evaluate S&H performance of project operations
- ▲ Maintain S&H records
- ▲ Report and investigate accidents and incidents
- ▲ Communicate with the COR to evaluate and resolve S&H issues.

#### **2.2.4 Safety and Health Manager**

The SHM is a Certified Industrial Hygienist (CIH) who's S&H responsibilities are listed below:

- ▲ Develop the site-specific SSHP
- ▲ Conduct S&H inspections and audits as scheduled by the PM
- ▲ Provide S&H technical assistance to the PM, Site Superintendent, and SSHO.

#### **2.2.5 Subcontractors**

Subcontractors will be used to provide selected services associated with performance of project work. Subcontractors who come on site to perform fieldwork and/or enter controlled areas of the site are subject to SSHP requirements. Subcontractor S&H responsibilities are listed below:

- ▲ Provide copies of required S&H training and certification documents to the SSHO, as applicable (i.e., licenses, training certifications, medical clearance [fitness for duty] certification, first-aid/cardiopulmonary resuscitation [CPR] training, respirator fit testing)
- ▲ Provide, before site work, a hazardous substances inventory list and copies of applicable MSDSs to the SSHO for hazardous substances to be brought on site by the subcontractor
- ▲ Provide an Activity Hazard Analysis (AHA) for subcontractor work activities. A detailed AHA is required for every phase of operations from all participants. The detail for the AHA should be to the extent that every phase and the tasks involved in those phases are considered to identify the associated hazards and risks during the operation. These task and hazard risk analyses must be modified as needed to address a changing work environment
- ▲ Enforce applicable SSHP requirements with subcontractor employees
- ▲ Review, understand, and comply with the SSHP and safety instructions from the SSHO, or other competent authority
- ▲ Observe the buddy system during work activities
- ▲ Promptly report unsafe work conditions or unsafe work practices to the subcontractor supervisor and the SSHO
- ▲ Immediately report all injuries or illnesses to the subcontractor supervisor and the SSHO.

#### **2.2.6 Site Personnel**

Site personnel S&H responsibilities are listed below:

- ▲ Understand and comply with the SSHP and instructions of the SSHO or other competent authority
- ▲ Promptly report any unsafe work conditions or unsafe work practices
- ▲ Immediately report all injuries or illnesses to their direct supervisor and the SSHO.

### 3.0 SITE HAZARDS

Site hazards and hazard control measures for chemical, physical, and biological hazards that are likely to be encountered during project work are reviewed in this section of the SSHP.

#### 3.1 Chemical Hazards

Chemical hazards expected to be encountered during project fieldwork are polychlorinated biphenyls in low concentrations (maximum soil concentration detected is 57 milligrams per kilogram [mg/kg]).

Table 1 provides chemical hazard information for anticipated site contaminants. The table includes a summary of the health effects, potential routes of entry, and the OSHA permissible exposure limits (PEL) or American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values (TLV) for these hazardous substances (lowest value).

##### 3.1.1 Hazardous Substances with Anticipated Use at the Site

A listing of hazardous substances with anticipated use during site fieldwork is provided below. A Hazardous Substances Inventory List will be prepared by the SSHO. The SSHO will maintain MSDSs for hazardous substances to be used during site work including:

- ▲ Fuels: diesel and gasoline fuel for vehicles and equipment
- ▲ Lubricants: oil, grease, antifreeze, and other lubricants for vehicles and equipment
- ▲ Fire extinguishing agent: Dry chemical for fire extinguishers
- ▲ Decontamination solutions: Decontamination solutions for sampling equipment
- ▲ Paint: Spray paint for marking of locations.

#### 3.2 Physical Hazards

The primary physical hazards that may be encountered during site work are indicated below (see Table 2). The following information describes physical hazard safety control measures to be used.

**Fire Protection (see Section 3.2.1):** Gasoline and/or diesel fuel will be used for vehicles, heavy equipment, and machinery operation. Fire extinguishers will be available on site. Hot work (work that uses a flame or creates sparks) is not expected for site work. Hot work permit procedures will be implemented if hot work becomes necessary.

**Underground and Overhead Utilities (see Section 3.2.2):** Underground and/or overhead utility lines may be present at the site. Subsurface work will require that a utility clearance survey be conducted before initiation. The presence of overhead utilities will be surveyed before bringing equipment with high extensions (e.g., heavy equipment, dump trucks) into a work area.

**Heavy Equipment Operation (see Section 3.2.3):** Heavy equipment will be used to perform excavation and earthmoving activities. Ground personnel will at times be working in the general vicinity of equipment operation. Heavy equipment will be inspected daily and documented. Ground personnel will position themselves out of the swing radius of operating heavy equipment whenever possible. Persons will not be allowed to walk underneath loaded buckets. When necessary, ground personnel will wear high-visibility safety vests with reflective striping and be required to maintain visual contact with equipment operators. Hand signals will be established.

**Excavation and Trench Safety (see Section 3.2.4):** Activities that involve personnel entry into excavations will require strict implementation of excavation safety procedures. Operations involving personnel entry into trenches that are 4 feet or more in depth or excavations that are 5 feet or more in depth require compliance with the OSHA "Excavation" standard. For these operations, a "Competent Person" will supervise operations, conduct daily inspections, and implement protective systems (sloping, benching, shielding, and/or shoring). Access to site excavation areas will be controlled and limited to authorized personnel only.

**Vehicle and Equipment Traffic Control (see Section 3.2.5):** Concurrent operations involving heavy equipment, dump trucks, and ground personnel will occur during site work. Traffic patterns will be established at the site for truck traffic as needed. Personnel will wear high-visibility safety vests with reflective striping when working near traffic areas. Spotters will be used if needed for backing of vehicles into tight work areas.

**Material Handling (see Section 3.2.6):** Material handling involving lifting and carrying of materials will be required. Personnel will review proper lifting techniques during safety meetings.

**Tools, Machinery, and Equipment Use (see Section 3.2.7):** Hand and power tools such as drills, saws (including chain saws), and wrenches will be used. Tools will be used according to design. Power tools requiring electrical cords will use ground fault circuit interrupters (GFCI).

**Electrical Equipment and Lockout/Tagout (see Section 3.2.8):** Electrical power on site may be provided using generators. GFCIs will be used and electrical extension cords inspected if portable electrical equipment is needed. Lockout/Tagout of electrical equipment for maintenance and servicing is not expected but will be conducted if needed.

**Noise Exposure (see Section 3.2.9):** Noise exposure above 85 decibels on the A-weighted scale (dBA) is expected when working near or operating machinery and equipment (e.g., heavy equipment, generators, compressors). Earplugs will be used for worker protection.

**Heat Stress (see Section 3.2.10):** Heat stress conditions may occur from elevated ambient temperatures, heavy workloads, and impermeable protective clothing use. Provisions will be made to establish break areas, provide fluids, and adjust work-rest schedules, as needed.

**Cold Stress (see Section 3.2.11):** Ambient temperatures below 45 degrees Fahrenheit (°F) may occur at times during site work (fall/winter/spring). Workers may be required to work outside in cold temperatures.

**Pressure Washer Operation (see Section 3.2.12):** Pressure washer equipment may be used for cleaning and equipment decontamination. Pressure washer equipment is not expected to be operated at high pressures. Face and eye protection will be provided for splash protection.

**Chain Saw Operation (see Section 3.2.13):** Chain saws may be used for tree removal. Safety procedures will be used when operating chain saws.

**Tree Removal Operations (see Section 3.2.14):** Tree removal operations may occur during site work. Measures will be taken to protect personnel from exposure to tree removal hazards.

**Wood Chipper Operation (see Section 3.2.15):** A wood chipper may be used during clearing and grubbing operations. Measures will be taken to protect personnel from exposure to tree removal hazards.

**Inclement Weather and Adverse Environmental Conditions (see Section 3.2.16):** Heavy rain, lightning, extreme temperatures, and strong winds could occur during outside work operations and provisions will be made to shut down outdoor operations if this occurs.

**Miscellaneous Physical Hazards (see Section 3.2.17):** General safety hazards will be present during all project tasks. Poor housekeeping; uneven or slippery walking surfaces; other slip, trip, and fall hazards; poor illumination; and overhead obstructions are primary hazards. General safety information will be communicated during safety meetings.

### **3.2.1 Fire Protection**

Procedures for fire hazards, fire protection, and hot work include:

- ▲ Smoking is not allowed in areas where flammable or combustible materials are present
- ▲ Fires and open flame devices must not be left unattended

- ▲ Portable multipurpose fire extinguishers must be maintained on site at all times, kept fully charged, inspected monthly, and serviced annually. Fire extinguishers are to be placed within 75 feet of active work areas where flammable or combustible materials are present
- ▲ OSHA-approved metal safety cans, painted red with a yellow stripe, with self-closing lids and flame arrestors should be used to store small quantities of flammable liquids
- ▲ Static electricity-generating equipment requires bonding and grounding whenever transferring flammable or combustible liquids or when working in areas where these materials are present
- ▲ Operation of equipment using open flames or creating sparks (i.e., torch cutting, grinding) requires implementation of hot work procedures. Hot work is not allowed without approval by the SSHO and completion of a "Hot Work Permit." A combustible gas indicator is used to determine if combustible vapors or gases exceed 10 percent of the lower explosive limit (LEL) before hot work in areas where flammable or combustible materials may be present. Hot work must be conducted under a fire watch with a dry chemical fire extinguisher, or equivalent. Hot work personnel should wear protective clothing (i.e., leather chaps, jacket) for protection from metal slag and sparks. Where potential exposure to injurious radiant energy from torch cutting or welding operations exists, filter protective lenses shall be used.

### 3.2.2 Underground and Overhead Utilities

Underground and overhead utility safety precautions include:

- ▲ The work area must be surveyed to identify underground utilities before subsurface work activity. Utility clearance procedures are implemented for excavation and/or other subsurface work activity by contacting the local utility locating organization (New Jersey One Call requires a minimum 3 full business days notice)
- ▲ The work area must be surveyed for overhead utilities and safety measures established before bringing equipment with high extensions on site (e.g., heavy equipment, dump trucks). Equipment with high overhead projections is not allowed to operate within a 10-foot radius (minimum distance) of overhead power lines. Overhead high-voltage power lines (more than 50,000 volts) require additional distance (verify voltage and required minimum clearance distance per EM 385-1-1 Table 11-1)
- ▲ Emergency procedures must be established before excavation in areas where underground and overhead utilities are known to be present. Emergency contact information for applicable utilities (i.e., electrical, natural gas, water, telephone, cable) must be determined
- ▲ In the event of contact with a utility line: Remove personnel from the area and control access to the affected area. Contact the utility company for immediate service.

### 3.2.3 Heavy Equipment Operation

Heavy equipment operation safety procedures include:

- ▲ Only experienced personnel will operate excavation equipment on site
- ▲ Heavy equipment must have rollover protection, seat belts, properly functioning brakes, fire extinguisher, and operating backup alarms and horns. Equipment will be checked daily at the beginning of each work shift and recorded by the equipment operator on a "Heavy Equipment Inspection Report" form to ensure the following systems and parts are in good working order: Service, emergency and parking brakes; tires/tracks; horn; steering mechanism; coupling devices; seat belts; operating controls; safety devices; fire extinguisher; and backup alarms
- ▲ Excavation work areas will be properly marked and guarded with barriers and/or caution tape to prevent unauthorized personnel entry and to prevent personnel from falling into open holes

- ▲ Workers will be required to wear high-visibility safety vests with reflective striping when working around heavy equipment
- ▲ Workers will be cautioned to look carefully where they walk to avoid moving equipment. Concurrent operations will be curtailed to prevent workers from being placed in dangerous proximity to moving heavy equipment
- ▲ Before entering the swing radius of operated heavy equipment, ground personnel must gain unobstructed eye contact with the equipment operator. Unobstructed eye contact with the equipment operator must be maintained at all times while working within the swing radius of the equipment. As a courtesy, ground personnel should "signal" the equipment operator when they are exiting the swing radius of the heavy equipment
- ▲ Personnel are not permitted to ride as passengers on heavy equipment
- ▲ Whenever equipment is parked, the parking brake will be set, and wheels will be chocked when on inclines. Bulldozer blades, hoe buckets, truck beds and the like will be fully lowered or blocked when not in use. Parts of machinery held aloft, such as hoe buckets or truck beds, will be blocked or cribbed before employees are allowed to work under or between them
- ▲ Dust control measures (i.e., water application) will be used as needed to minimize airborne dust during heavy equipment operation.

#### 3.2.4 Excavation and Trench Safety

Excavation and trenching requirements include those contained in the OSHA 29 CFR Subpart P 1926.650-652 standard "Excavations," and USACE EM 385-1-1 section entitled "Excavations." Compliance with these requirements must be maintained when digging trenches and excavations, particularly when personnel will be required to enter trenches 4 feet or more in depth or excavations 5 feet or more in depth. Excavation and trenching safety procedures include the following:

- ▲ Conduct and review utility clearance information, and determine the location of overhead and underground utilities before excavating
- ▲ Contact the local utility locating organization before excavation operations (**New Jersey One Call requires a minimum 3 full business days notice**), obtain a permit (as required), and re-notify them if an extended excavation period is required
- ▲ Delineate the areas to be excavated with white paint or other suitable markings. Before excavating, check for the local utility location markings with the following color code:

<u>RED:</u>	Electric Power
<u>YELLOW:</u>	Gas Distribution
<u>ORANGE:</u>	Telephone and Communications
<u>BLUE:</u>	Water
<u>GREEN:</u>	Sewer

- ▲ Find the exact location of substructures by hand excavation methods if sensitive underground substructures are present. It is recommended a 24-inch clearance from exterior walls of subsurface installations be maintained, as required by the SSOH or Competent Person
- ▲ Ensure no construction equipment or personnel come closer than 10 feet from an energized overhead electrical line. Overhead high-voltage power lines greater than 50,000 volts require additional distance. Reference EM 385-1-1 section entitled "Electrical"

- ▲ EM 385-1-1(11)(E) requires the following minimum clearance from energized overhead electrical lines for the indicated voltages: 0-50 kV (9.8 feet); 51-200 kV (14.7 feet); 201-300 kV (19.7 feet); 301-500 kV (24.6 feet); 501-750 kV (34.4 feet); and 751-1,000 kV (44.3 feet)
- ▲ Properly mark and protect excavations to prevent personnel from falling into an open hole. Fence, barricade, tape off, or otherwise secure open trenches during nonwork periods
- ▲ Surface encumbrances near the excavation (e.g., trees, boulders, poles) must be removed
- ▲ A designated OSHA "Competent Person" must provide onsite supervision during excavation activities and must be present at all times when personnel are in the excavation. The Competent Person must examine the excavation before entry into the excavation; must make daily inspections of excavations, adjacent areas, and protective systems where employee exposures exist; and must inspect the excavation after a rainstorm or other hazard-increasing occurrence. Daily inspections are to be recorded by the Competent Person on the "Excavation Safety Checklist" and "Excavation Safety Soil Analysis Checklists"
- ▲ Use of protective systems such as shoring, sloping, benching, or shielding, is required for personnel entry into trenches 4 feet or more in depth and excavations 5 feet or more in depth, and shallower excavations unless a "Competent Person" determines there is no potential for cave-ins. Use of protective systems is not required for personnel entry into trenches less than 4 feet in depth and excavations less than 5 feet in depth that have been examined by a "Competent Person" who has determined there is no potential for cave-ins
- ▲ Access for ingress into or egress out of an excavation is required within 25 feet of lateral travel for trenches 4 feet or more in depth into which persons will descend. Stairways, ladders, or ramps must be provided for excavation access. Reference EM 385-1-1 section entitled "Excavations"
- ▲ Persons exposed to equipment and vehicle traffic are required to wear high-visibility safety vests with reflective striping
- ▲ Mobile equipment warning systems are required when equipment operators do not have a clear and direct view of the edge of the excavation
- ▲ Excavated materials must not be placed closer than 2 feet from the edge of trenches and excavations
- ▲ Trenches shall be crossed only when safe crossing is provided. For excavations greater than 7.5 feet deep, standard guardrails and toe boards are required on walkways or bridges
- ▲ Persons are not permitted underneath loads handled by digging equipment. Employee protection from falling into the vicinity of operating excavation equipment is required
- ▲ Water accumulation in or adjacent to excavations must be prevented through diversion ditches or dikes
- ▲ Excavation work is not allowed to be conducted at the base of foundations, retaining walls or other structures until a Competent Person inspects the area and determines no hazard of undermining exists
- ▲ Existing walls or other structures are not to be used as retaining walls to hold part of an excavation or backfill unless it will safely withstand all expected loads
- ▲ Braces or other supports are required for excavations adjacent to streets, railroads or other sources of vibration or superimposed loads
- ▲ Tractors, backhoes, bulldozers, and excavators must be operated cautiously where there is a possibility of overturning in dangerous areas such as edges of deep fills, cut banks, and steep slopes. Cuts below banks and cliffs are not allowed when excavating equipment is operating near the top of them

- ▲ Atmospheric testing is required in excavations where oxygen-deficient or hazardous atmospheres exist or could reasonably be expected to exist. If hazardous atmospheres are present, ventilation, respiratory protection, and atmospheric testing must be used and emergency equipment must be readily available (e.g., self-contained breathing apparatus (SCBA), safety harness and line, basket stretcher)
- ▲ The Competent Person must classify each soil and rock deposit as stable rock; Type A soil, Type B soil, or Type C soil. Soil classification is made based on the results of at least one visual test and one manual test to identify the properties, factors, and conditions affecting the classification of the soil
- ▲ Layered systems are classified as its weakest layer or by each layer individually where a more stable layer lies under a less stable layer
- ▲ Changes in the properties, factors, or conditions of a deposit must be evaluated by a Competent Person and reclassified, as necessary
- ▲ A Competent Person shall complete a visual soil classification test by observing the excavated soil, estimating the particle size range and relative amounts, and checking the excavation and the area adjacent to the excavation for: soil cohesion; tension cracks that could indicate fissured material; chunks of soil that spall off a vertical side that could indicate fissures; existing utility and other underground structures; previously disturbed soil; layered systems that slope toward the excavation; evidence of surface water or water seeping from sides of the excavation; and sources of vibration
- ▲ A Competent Person shall complete at least one of the following manual soil classification tests to determine qualitative and quantitative information for soil and rock deposit classification: plasticity test, dry strength test, thumb penetration test, pocket penetrometer test, hand-operated shear vane test, or drying test
- ▲ Visual and manual soil classification tests will be recorded on the "Excavation Safety Soil Analysis Checklist" form
- ▲ A Registered Professional Engineer is required to design sloping, benching, or other protective systems for excavations greater than 20 feet deep
- ▲ Maximum allowable sloping when used as an excavation protection system is classified according to the soil or rock type below:

<u>Stable Rock:</u>	Maximum allowable slope (horizontal to vertical) of 90°
<u>Type A Soil:</u>	Maximum allowable slope (horizontal to vertical) of ¾ to 1 (53°)
<u>Type B Soil:</u>	Maximum allowable slope (horizontal to vertical) of 1 to 1 (45°)
<u>Type C Soil:</u>	Maximum allowable slope (horizontal to vertical) of 1-1/2 to 1 (34°).

### 3.2.5 Vehicle and Equipment Traffic Control

Vehicle and equipment traffic control procedures are required due to the presence of concurrent vehicle, equipment, and/or pedestrian traffic. Vehicle and equipment traffic safety procedures include the following:

- ▲ Personnel are required to wear high-visibility safety vests with reflective striping where exposure to vehicle or equipment traffic exists
- ▲ Workers will be cautioned to look carefully where they walk to avoid vehicles and moving equipment and to maintain eye contact with equipment operators

- ▲ Use traffic signs, barricades, flashers, delineators, traffic cones, caution tape, or flagmen (as needed) around work areas with vehicle or equipment traffic
- ▲ The PM, Site Superintendent, and/or SSHO will establish vehicle and equipment traffic patterns to be used. Traffic haul routes will be identified during daily safety meetings and will take into account times and locations of concern for vehicle, equipment, and pedestrian traffic exposures in the work area
- ▲ Only properly licensed and permitted drivers will be allowed to transport hazardous materials. Drivers will have a current U.S. Department of Transportation (DOT) medical exam and are subject to DOT drug and alcohol testing, as required. Drivers will observe all DOT requirements for transport of hazardous materials and hazardous waste including requirements for: driver training; shipping papers (i.e., bill of lading, hazardous waste manifest); proper containers (approved container, adequate closure, compatible material); labeling and marking of containers; loading and placarding of vehicles; securing the load; and hours of service
- ▲ Drivers will ensure areas are clear before backing vehicles and will use a spotter, if needed
- ▲ Drivers will watch for overhead utility line clearance
- ▲ Drivers will stay inside truck cabs with windows closed during loading except when directed otherwise by the SSHO. When outside of vehicles, drivers will wear hard hats and other prescribed PPE, as directed
- ▲ As required, drivers will use truck bed liners and tarp truckloads of contaminated waste before transport. Personnel assisting with the tarping of vehicle loads will place wheel chocks, use ladders and/or scaffolding, and wear fall protection equipment, as required by the SSHO, to minimize fall hazards. Workers are not to step on wheels or tires to climb onto truck siding
- ▲ Vehicles exiting a site exclusion zone will have tires and affected exteriors decontaminated using methods directed by the SSHO
- ▲ Drivers will keep vehicle windshields and mirrors clean. Drivers will keep vehicle steps clean and drivers will watch their step when exiting vehicles to avoid ankle sprains.

### 3.2.6 Material Handling

Procedures for material handling, storage, and disposal include:

- ▲ Material handling devices should be used for handling heavy or bulky items whenever possible instead of manual material handling. Whenever handling heavy or bulky items, the material handling needs should be evaluated in terms of weight, size, distance, and path of movement. The following hierarchy for selection of material handling means should be used: elimination of material handling needs by engineering; movement of material by mechanical device (i.e., lift truck, overhead crane, conveyor); movement by manual means with handling aid (i.e., dolly, cart); and movement using safe lifting techniques
- ▲ Personnel must be trained in safe lifting procedures including: size up the load first; get help if the load is bulky, heavy, or of unwieldy length; be sure of footing; lift with your legs while keeping your back straight; keep your balance; do not twist under strain or jerk the load; and keep the load close to your body
- ▲ When two or more persons are carrying long material together, all persons must carry the material on the same shoulder and lift or lower the material in unison.

### 3.2.7 Tools, Machinery, and Equipment Use

Safety procedures for use of tools, machinery, and equipment include:

- ▲ Equipment and tool inspection and maintenance are required to promote safe condition for the intended use. Tools and equipment should be inspected daily or before each use for defects. Tools with burred, broomed, mushroomed, split or loose handles, worn or sprung jaws; and generally unsafe tools should be turned in to the SSHO
- ▲ Defective or unsafe equipment must be tagged as defective until repaired or otherwise made acceptable. Defective or unsafe equipment must be removed to a secure place to prevent inadvertent use until repaired. Repaired items must be re-inspected by the SSHO before being placed back into service
- ▲ Equipment must be used only for the purpose for which it was designed. Use tools properly (i.e., do not use a wrench for a hammer, a screwdriver for a chisel, pliers for a wrench, a pipe handle-extension or a "cheater" on a wrench etc.). All modifications, extensions, replacement parts, or repairs of equipment must maintain at least the same factor of safety as the original equipment
- ▲ Equipment containing liquid systems (i.e., fuel, hydraulic, lubrication) are to be inspected daily to ensure liquid-containing systems (e.g., hoses, tubing, hydraulic lines) are in good operating condition and plugs, stoppers, valves, etc., are properly seated
- ▲ Tools, equipment, or material should not be thrown up or down from one working level to another. A hand line should always be used to lift or lower tools
- ▲ Nails or spikes should not be left protruding from planks, boards, or other timbers. Nails or spikes should be pulled out or clinched (bend them over) into the wood
- ▲ Machinery or equipment must not be operated without proper training and special permission unless it is a regularly assigned duty
- ▲ Loose or frayed clothing, dangling ties, rings, etc., must not be worn around moving machinery or other mechanical sources of entanglement
- ▲ Work should not be performed under vehicles supported by jacks or chain hoists, without protective blocking that will prevent injury if jacks or hoists fail
- ▲ Air hoses should not be disconnected from compressors until the air within the hoses has been bled off
- ▲ Electrical power tools, lighting equipment, etc. must be properly grounded by using three-wire receptacles and extension cords rated for the amperage required. GFCIs or another proper grounding system should be used with temporary electrical systems
- ▲ Portable electric tools must not be lifted or lowered by means of a power cord. Electrical equipment cords should be kept coiled when not in use. When electrical equipment is in use, cords should be protected and positioned to avoid tripping hazards and being run over by vehicles or equipment
- ▲ Machinery must not be repaired or adjusted while in operation. Oiling of moving parts must not be attempted except on equipment that is designed or fitted with safeguards to protect the person performing the work.

### **3.2.8 Electrical Equipment and Lockout/Tagout**

Electrical equipment use on site requires positive control of hazardous energy during servicing and maintenance of equipment to prevent unexpected energizing, start-up of equipment, or release of stored energy. Electrical equipment and lockout/tagout procedures include:

- ▲ Personnel working on site must ensure that electrical power tools, lighting equipment, etc., that are to be used have ground plugs and are plugged into ground outlets or extension cords. The plugs are not to be altered or used incorrectly (such as the addition of nongrounded plug adapters)
- ▲ Personnel must use GFCIs in conjunction with extension cords
- ▲ Energy sources for equipment must be turned off or disconnected and switches locked out and tagged out before servicing of equipment. Standardized locks and tags are to be used to indicate the identity of the individual using them. Each lockout/tagout device is required to be removed by the individual who applied the device.

### 3.2.9 Noise Exposure

The operation of equipment and machinery at the site may generate excessive noise levels and requires:

- ▲ CAPE has hearing conservation program that is in compliance with OSHA 29 CFR 1910.95 requirements
- ▲ Control of noise to safe levels for occupational exposures is expected to result in acceptable levels of noise at the work site perimeter
- ▲ Site personnel working in the immediate area of operating equipment are required to use hearing protection (e.g., foam ear plugs) whenever noise exposures exceed 85 dBA
- ▲ Noise exposures in excess of 85 dBA are assumed to be present whenever voices must be raised to be heard in normal conversation at 3 feet apart and also whenever working in the immediate areas of operating generators, compressors, and similar equipment.

### 3.2.10 Heat Stress

Heat stress precautions and prevention measures include:

- ▲ Personnel must be aware of the potential for heat stress during periods of elevated ambient temperatures, moderate to heavy workloads, and when impermeable protective clothing is in use
- ▲ Personnel will be informed about the various forms of heat stress (e.g., heat cramps, heat exhaustion, heat stroke) and the symptoms of exposure, including: Heat Cramps and Heat Exhaustion: initial symptoms are cramps, faintness, dizziness or disorientation, and pale, clammy skin. Heat Stroke: an extremely serious medical emergency with sudden onset and symptoms that include dilated pupils, dry and hot skin, loss of consciousness, and convulsions
- ▲ Initial phases of work activity must be closely monitored by the SSHO because workers may not be acclimatized to hot conditions. The SSHO will try to identify personnel who are more susceptible to heat exposure
- ▲ Workers are responsible for observing each other and themselves for development of heat stress symptoms. Personnel will be encouraged to drink generous amounts of water and electrolyte replacement fluids (even if not thirsty) to prevent dehydration. Adequate shelter will be provided to protect personnel from direct sun exposure. Sufficient breaks will be provided so personnel can remove protective clothing and cool down. Work/Rest regimens will be adjusted as required to avoid heat stress
- ▲ A monitoring program for heat stress will be implemented if elevated ambient temperatures (greater than 70°F) and concurrent use of impermeable protective garments occurs.

### 3.2.11 Cold Stress

Cold stress can occur upon exposure to cold environments where there is heat loss to the body, feet, hands, and/or head. Primary cold stress injuries are hypothermia and frostbite. Cold can also adversely affect mental capabilities resulting in accidents or injuries. The body's initial responses to cold are: shivering, vasoconstriction, increased oxygen consumption, accelerated respiration and pulse, and increased heart output and blood pressure. Cold stress precautions and prevention measures include:

- ▲ Personnel will be informed about the various forms of cold stress (e.g., hypothermia, frostbite) and the symptoms of exposure, which are: Hypothermia: Hypothermia occurs when the body core temperature falls below 96.8°F. Symptoms include intense uncontrollable shivering, sluggish thinking, difficulty speaking, muscular rigidity, blue puffy skin, poor coordination, cessation of shivering, dulled thinking, irrational stupor, unconsciousness, erratic heartbeat, slowed respiration, cardiac and/or respiratory failure, lung edema, and death. Treatment for hypothermia is to re-warm the body trunk, immerse in warm water (105°F) or use heat packs. Frostbite: Frostbite occurs due to freezing of fluid that surrounds tissues. It occurs at less than 30°F, and more rapidly with wind exposure. Frostbite affects the ears, chin, nose, fingers, and toes. Frostbite first appears as blanched skin or waxy or white skin that is firm to the touch with resilient tissue beneath. With deep frostbite, tissues are cold, pale, solid, and may turn black. Treatment for frostbite is to re-warm with warm water (105°F) and prevent refreezing of affected body parts. Use personal protection by dressing for warmth, wind, and wet conditions. Wear layered clothing (i.e., wear thinner, lighter clothing next to the body with heavier clothing layered outside the inner clothing)
- ▲ Stay active, as activity generates heat
- ▲ Provide a warm break area when working in cold environments
- ▲ Have first-aid equipment available
- ▲ At temperatures lower than 25°F, do not permit continuous cold exposure to exposed skin. At temperatures lower than 45°F, wear warm clothing to include as needed: Boots; heavy socks (e.g. wool or polypropylene), mittens, insulated gloves, insulated head covers, thermal underwear, and insulated coveralls
- ▲ Provide for a change of clothing for workers who are immersed in water or whose clothing becomes soaked through. In this situation, treat for hypothermia if symptoms become evident.

### 3.2.12 Pressure Washer Operation

The use of pressure washer equipment requires:

- ▲ Only trained and experienced personnel will operate pressure-washing equipment
- ▲ All electrical equipment will be shut off and locked out/tagged out before application of water in affected work areas
- ▲ Pressure washing equipment operators will barricade/tape off around work areas as needed
- ▲ Pressure washing equipment operators will wear protective boots, protective clothing, hearing protection, face shields, goggles and/or safety glasses, and other PPE, as appropriate
- ▲ Metatarsal foot guards will be used when using high-pressure water (greater than 1,200 pounds per square inch)
- ▲ A fire extinguisher will be maintained on each pressure washer unit.

### 3.2.13 Chain Saw Operation

Chain saw use can be dangerous unless proper procedures are used:

- ▲ Chain saws must have an automatic chain brake or anti-kickback device
- ▲ The idle speed of chain saws must be adjusted so that the chain does not move when the engine is idling
- ▲ Chain saw operators must wear PPE to include eye, ear, hand, foot, and leg (chaps) protective equipment
- ▲ Chain saws will not be fueled while running, while hot, or near an open flame. Chain saws will not be started within 10 feet of a fuel container. Gasoline and mixed gas fuels for chain saws will be stored in OSHA-approved metal cans with self-closing lids and flame arrestor
- ▲ Chain saw operators will hold the saw with both hands during cutting operations
- ▲ A chain saw must never be used to cut above the operator's shoulder height.

### 3.2.14 Tree Removal Operations

Tree removal operations safety procedures include:

- ▲ Only experienced and qualified tree removal personnel will be used for tree removal work
- ▲ Inspections will be made for tree removal work to see if electrical line hazards exist and workers will maintain a minimum 10-foot clearance from lines whenever possible
- ▲ Before tree felling operations, the following observations and considerations will be made: survey the tree and surrounding area for items that may be impacted when the tree falls; consider the shape of the tree, the lean of the tree, and decayed or weak spots; observe wind force and direction; determine the location of other people in the area; locate any equipment on the ground in the area; and identify any electrical or other utilities in the area
- ▲ Before tree felling, the work area will be cleared to permit safe working conditions and an escape route will be planned
- ▲ Each worker in the area will be instructed as to specific duties and workers not directly involved in the tree felling will keep clear of the area
- ▲ Brush, fallen trees, and other materials that might interfere with cutting operations will be removed from the area before tree felling
- ▲ Tree limbs and branches will be removed to a height and width sufficient to allow the tree to fall clear of any utility lines and other objects in the vicinity of the fall location
- ▲ If there is the danger that the tree being felled may fall in the wrong direction or damage property, then wedges, block and tackle, rope, or wire cable (except when an electrical hazard exists) will be used
- ▲ Cutting methods for tree felling include: a notch and back cut will be used to fell trees more than 5 inches in diameter (measured at chest height) and no trees will be felled by slicing or ripping cuts; the depth or penetration of the notch will be about one-third the diameter of the tree and the opening or height of the notch will be about 2.5 inches for each foot of the tree's diameter; and the back cut will be made higher (approximately 2 inches) than the base of the notch to prevent kickback

- ▲ The operator will maintain sure footing and work from the uphill side whenever possible
- ▲ Just before the tree or limb is ready to fall, an audible warning will be given to those in the area to stay safely out of range when the tree falls
- ▲ Persons will stand well back of the butt of the tree that is starting to fall.

### 3.2.15 Wood Chipper Operation

Wood and brush chipping equipment safety procedures include:

- ▲ Rotary drum and disk-type wood chippers not equipped with a mechanical in-feed system will: be equipped with an in-feed hopper located 85 inches or more above the ground (measured from blades to ground level over centerline of the hopper) and will have sufficient height on its side members to prevent personnel from contacting machine blades during normal operation; and have a flexible anti-kickback device installed in the in-feed hopper to protect the operator and other personnel in the machine area from flying chips and debris
- ▲ Disk-type wood chippers equipped with a mechanical in-feed system will have a quick stop and reversing device on the in-feed. The activating mechanism for the quick stop and reversing device will be located across from the top, along each side, and as close as possible to the feed end of the in-feed hopper and within easy reach of the operator
- ▲ Wood chipping equipment will: have a feed chute or feed table with sufficient height on side members to prevent operator contact with blades during normal operation; have a swinging baffle mounted in front of blades to prevent throwback of material; have an exhaust chute of sufficient length or design to prevent contact with blades; have a locking device on the ignition system to prevent unauthorized starting of equipment; and have cutting bars and blades sharpened, properly adjusted, and maintained in accordance with manufacturer recommendations
- ▲ Trailer mounted wood chippers detached from trucks will be chocked and secured when parked
- ▲ Wood chipper workers will be instructed in the safe operation of the equipment and the wood chipper machine will be operated in accordance with manufacturer recommendations
- ▲ Workers feeding brush into wood chippers will wear eye protection and will not wear loose clothing, long-gauntlet gloves, rings, watches, or other items that could get caught on debris or parts of the machine
- ▲ Workers will be instructed to never place any part of their body on the feed table when the wood chipper is in operation or the rotor is turning (sticks of brush can be used to push/poke material)
- ▲ Materials will be fed into wood chippers from the side of the hopper centerline and operators will immediately turn away from the feed table when brush is taken into the rotor of the machine
- ▲ Materials such as stones, nails, and other hard/sharp debris will not be fed into wood chippers
- ▲ Wood chipper chutes will not be raised while machine rotors are turning
- ▲ When servicing or maintaining wood chipper equipment, lockout/tagout procedures will be used to prevent accidental start-up of machinery during servicing.

### 3.2.16 Inclement Weather and Adverse Environmental Conditions

In cases of inclement weather for outside work locations or other adverse environmental conditions (i.e., strong winds, rain, freezing, lightning, hurricane, tornado, earthquake) the following safety instructions are required:

- ▲ Presence of strong winds requires suspension of affected work activities at elevated work locations (e.g., towers, roofs, ladders, scaffolds, platforms) and discontinuing use of equipment whose safe operation can be affected by high winds (i.e., drill rigs, man lifts, scissor lifts, cranes)
- ▲ Presence of heavy rain or other precipitation requires suspension of affected work activities where the precipitation can create safety hazards due to limited visibility, wet work surfaces, slippery equipment controls, increased electrical hazards, cold stress, etc.
- ▲ Presence of lightning requires suspension of affected work activities where lightning presents an increased safety hazard of electrocution (e.g., cranes, heavy equipment, drill rigs, tanks, towers)
- ▲ Occurrence of a hurricane, tornado, or earthquake requires suspension of affected work activities and evacuation of personnel from excavations and trenches, confined spaces, and buildings of questionable stability
- ▲ In case of work suspension due to inclement weather conditions or other adverse environmental conditions, work will not resume until an all clear signal has been communicated by the SSHO to affected personnel. In case of work suspension due to lightning, an all clear will not be given until no lightning has appeared in the area for a period of 10 minutes
- ▲ In the case of severe weather conditions, emergency evacuation procedures shall be established where high winds, strong storms, tornadoes, hurricanes, and floods are a potential occurrence. The SSHO shall monitor the local weather conditions and advise the PM when the U.S. Weather Service issues severe storm warnings. When a severe weather warning is issued, the Site Superintendent and SSHO will begin taking actions to secure the worksite. In the event of impending severe weather conditions, personnel will be advised of the hazard, and an evacuation order will be issued by the SSHO. All site personnel shall immediately evacuate the work area to a designated location (i.e., hotel). The SSHO will notify the PM and advise him that all site personnel are evacuating the area. The SSHO shall maintain contact with site personnel and provide the PM with periodic updates as to the whereabouts of all site personnel. Site personnel shall remain outside the evacuation area at a designated location until notified by the PM that it is safe to return to the work area. After severe weather conditions have passed, the Site Superintendent and SSHO will mobilize to the worksite, inspect the condition and security of the site, and make any necessary response actions to correct unacceptable conditions.

### **3.2.17 Miscellaneous Physical Hazards**

Miscellaneous physical hazards and safety procedures to be followed are reviewed with personnel in safety meetings and may include discussion of the following topics:

- ▲ Poor housekeeping
- ▲ Poor illumination
- ▲ Overhead obstructions
- ▲ Sharp objects
- ▲ Uneven walking surfaces
- ▲ Slippery work surfaces
- ▲ Tripping hazards
- ▲ Fall hazards.

### **3.3 Biological Hazards**

Biological hazards that may potentially be encountered during site work include:

- ▲ Poisonous plants
- ▲ Poisonous snakes
- ▲ Poisonous spiders
- ▲ Rodents
- ▲ Ants and bees

- ▲ Ticks
- ▲ Mosquitoes.

### 3.3.1 Poisonous Plants

Contact with poisonous plants such as poison oak, poison ivy, or poison sumac can result in dermatitis. These plants have a resin called "urushiol," which is derived from the Japanese word for "sap," that poses a threat to sensitive individuals. The skin reacts to the resin upon contact causing dermatitis characterized by linear streaks and red bumps where the plant has brushed against the skin. Contact with the smoke from burning poisonous plants also causes severe reactions in the respiratory tract and exposed skin in sensitive individuals. Signs and symptoms of exposure are redness, swelling, blisters, and intense itching. Blisters form within 24 hours, weeping, crusting and scaling of the blisters within a few days, and complete healing occurs in about 10 days.

Poison ivy grows throughout the eastern, Midwestern, and southern regions of the United States. It can appear as a ground cover, small shrub, or vine with compound leaves consisting of three leaflets. This trait is easily remembered by an old rhyme "leaves of three, let them be." It emerges in the spring with reddish-green leaves, which turn green in summer, then turn red, orange, and yellow in the fall. It has yellowish-white flower clusters in late spring through early summer; and white berry clusters in winter.

Poison sumac grows in the northern and southern regions of the United States. It appears as a tall shrub or small tree with compound leaves consisting of seven to 13 leaflets arranged in pairs, with one on the end of the midrib. It is green in spring and summer, turning red in fall. It has yellowish-green flower clusters in late spring through early summer; and whitish-green berry clusters in fall.

Poison oak grows primarily in the western and southeastern United States. Poison oak appears as a small shrub with compound leaves consisting of three leaflets. Again, the "leaves of three, let them be" rhyme applies. It has green leaves in the spring and summer, and red and yellow leaves in the fall. Black dots of dried sap (resin) on the leaves are also characteristic of the plant. It has whitish-green flowers in the spring; and white berries in late summer.

Poison plant first-aid procedures are: washing, without scrubbing, of the affected area with mild soap and water, application of a paste of baking soda and water on the area several times a day, or application of an anti-cortical cream or lotion, such as Calamine or Caladryl, to help soothe the area. Antihistamines, such as Benadryl, may also help dry up the sores. If the condition worsens or persists and affects large areas of the body or the face, see a doctor. It may be necessary to give anti-inflammatory drugs, such as corticosteroids, or other medications to relieve discomfort.

### 3.3.2 Poisonous Snakes

Poisonous snakes may be encountered during site work. The rattlesnake has a series of dark and light bands near the tail just before the rattles that are different from the rest of the body. Rattlesnake bite signs and symptoms of envenomation include: fang marks; metallic or rubbery taste in mouth; tingling of the tongue; numbness; swelling within 10 minutes of bite; nausea, weakness, temperature change; and discoloration within 3 hours to 6 hours.

Poisonous snake precautions include: avoid walking in areas known to be populated with snakes; avoid traveling on foot at night; avoid traveling off trails or paths in grassy or brush-laden areas; do not climb into rocky areas without visual inspection for snakes; be alert when moving debris as snakes seek shelter in shaded areas; wear high-top boots and long pants when walking in grassy areas; clear brush from around buildings, check/repair leaky faucets, and keep trash in containers with secure lids. If a snake is encountered, look around, there may be others, then turn around and walk away on the same path traveled.

Poisonous snake bite first-aid procedures are: summon emergency medical help immediately; have victim stay calm and remain motionless, if possible; position victim so that bite is kept below heart level, if possible; do not use ice, cold packs, sprays, alcohol, or any drugs; do not use tight tourniquet, apply light constricting band above bite (be able to insert finger under band) and do not release band, unless too tight from swelling; do not make incision across bite to suck out venom; and do not wait to see if symptoms develop, seek medical attention as soon as possible.

### 3.3.3 Poisonous Spiders

Poisonous spiders, such as the black widow spider or the brown recluse spider, may be encountered during site work. Spiders are usually found in dark, cool, protected areas and such areas should be inspected before placing hands or feet in these areas. Poisonous spiders are commonly found in woodpiles, sheds, basements, garages, and privies.

The primary species of black widow spider encountered has a glossy black appearance with an orange-red hourglass shape on the underside of the body. Black widow spider bite signs and symptoms are: initial pain followed by dull, occasionally numbing pain in the affected extremity; pain and cramps in one or several of the large body muscles; abdominal pain and cramping; sweating, increased salivation, anxiety, weakness, headache, and dizziness; and severe cases can result in uncontrollable muscle spasms, coma, and respiratory failure. Black widow spider bite first-aid procedures are: wash wound; apply a cold pack; and get medical care (e.g., muscle relaxants; antivenin)

The brown recluse spider is also known as the "violin or fiddle back" spider and is light brown in color with a darker brown violin-like marking on the top of the body. The brown recluse spider is nonaggressive, and most bites occur when the spider is trapped in clothing being put on, stepped on, and when areas where the spider resides are disturbed. Brown recluse spider bite signs and symptoms are: localized burning sensation within 2 hours to 8 hours with itching and redness; small blanched area around immediate bite area appears; reddened area enlarges and becomes purple during subsequent 1 hour to 8 hours; and fever, malaise, stomach cramps, nausea, vomiting, and some cases have resulted in death. Brown recluse spider bite first-aid procedures are: wash wound; apply a cold pack; and seek immediate medical care.

### 3.3.4 Rodents

Rodents include rats, mice, squirrels, and other related mammals and are characterized by gnawing and nibbling traits. Rodents can act as a vector for many diseases that may be transmitted directly or through other vectors such as fleas or ticks. Diseases that can be transmitted include plague, typhus, Leptospirosis, relapsing fever, and others including Hantavirus pulmonary syndrome. A discussion of Hantavirus pulmonary syndrome is presented below, as it is a relatively recent disease transmitted by rodents.

#### Hantavirus Pulmonary Syndrome

Hantavirus pulmonary syndrome is a serious, often deadly, respiratory disease that has been found mostly in rural areas of the western United States. A Hantavirus causes the disease. The virus is carried by rodents and passed on to humans through infected rodent urine, saliva, or droppings. The deer mouse is the primary carrier of the virus that causes Hantavirus pulmonary syndrome. This type of rodent is found throughout the United States, except in the Southeast and East Coast. In the Southeast, the cotton rat is known to carry Hantavirus. A deer mouse is 4 inches to 9 inches long from head to tip of tail. It is pale gray to reddish brown; has white fur on its belly, feet, and underside of the tail; and has oversized ears. A mouse nest (burrow) is usually a pile of material under which the mouse lives. This pile can contain many different materials, such as twigs, insulation, Styrofoam, and grass.

Hantavirus is spread from wild rodents to people. The virus gets in the air as mist from urine and saliva or dust from feces. Breathing in the virus is the most common way of becoming infected; however, infection can also occur by touching the mouth or nose after handling contaminated materials. A rodent's bite can also spread the virus. Hantavirus is not spread from person to person. Infection will not occur from being near a person who has Hantavirus pulmonary syndrome. The virus, which is able to survive in the environment (e.g., contaminated dirt and dust), can be killed by most household disinfectants, such as bleach or alcohol.

Symptoms of Hantavirus pulmonary syndrome usually appear within 2 weeks of infection but can appear as early as 3 days to as late as 6 weeks after infection. First symptoms are general and flu-like: fever (101 to 104°F); headache; abdominal, joint, and lower back pain; sometimes nausea, and vomiting. However, the primary symptom of this disease is difficulty in breathing, which is caused by fluid build-up in the lungs and quickly progresses to an inability to breathe.

Precautionary measures to avoid exposure to Hantavirus include: avoid and/or be cautious when working near wood piles, inside sheds or other known deer mouse habitats; when evidence of deer mice is observed, stop work and notify supervisor immediately; establish specific work procedures, protective clothing, respiratory protection, and decontamination protocol for work in the area, and review hazards and control measures with workers; spray a concentrated solution of bleach (10 percent minimum) on areas where rodent feces or nesting materials are present and let the disinfectant sit for a period of time before working in the area; wear protective clothing (i.e., disposable coveralls, gloves, boots, or booties) and respirator (air-purifying respirator [APR] with high-efficiency particulate air [HEPA] filter); remove contaminated materials carefully; minimize dust generation; use HEPA filter vacuum equipment, as needed; and collect contaminated materials and place in plastic bags/seal for disposal as directed by the SSHO

Upon exiting from the work area, wash gloved hands in a 1 percent bleach solution, remove clothing being careful not to contact potentially contaminated surfaces, and thoroughly wash with soap and water immediately following removal of PPE.

### 3.3.5 Ants and Bees

Ant bites and bee, wasp, and hornet stings can be deadly to those who are hypersensitive. Anaphylactic shock can occur to sensitized individuals upon repeated stinging. Signs and symptoms of envenomation are usually local pain, redness, itching, and swelling. Sensitive individuals may have more serious symptoms such as welts, itching palms and feet, headache, nausea, vomiting, labored breathing, and in severe cases respiratory paralysis or heart failure.

Bee precautions include: Conduct a reconnaissance of areas where bee, hornet and wasp hives may be encountered (i.e., clearing and grubbing) before beginning work in an area; apply insecticide (where allowed) to rid the work area of bees; ensure that site personnel who have a recent history of bee, hornet and/or wasp stings have reported this to the SSHO; hypersensitive individuals should carry a bee sting injection kit prescribed by the physician with them in case of emergency; and over-the-counter antihistamine medication should be available in case of a bee sting.

### 3.3.6 Ticks

Infected wood ticks and dog ticks can act as a vector for many diseases including Rocky Mountain spotted fever, Q fever, relapsing fever, Lyme disease, and tularemia. Adult ticks are reddish brown in color and may have white markings on the back. They are usually 1/4-inch long, are oblong or seed-shaped, and have eight legs. The adult wood tick appears during the spring and early summer months in the northwestern states, and the dog tick appears throughout the summer in the eastern and southern states. The disease-carrying organism is transmitted to humans through the bite of the tick or by contact with crushed tick blood or feces through a scratch or wound. Risk of exposure is increased if working in wooded, brushy, or grassy areas. Infection can occur throughout the year, however, spring through summer marks the seasons that correspond with the ticks lifecycle and people's increased outdoor activity, thus increasing the risk of exposure.

Rocky Mountain spotted fever is the most severe and most frequently reported rickettsial illness in the United States. Initial signs and symptoms are non-specific and typically include fever, nausea, vomiting, severe headache, lack of appetite, and muscle pain. Later signs and symptoms include a red spotted rash, abdominal pain, joint pain, and diarrhea.

Lyme disease is spread to people through the bite of an infected tick. It is not communicable person to person or by a household pet. The early signs and symptoms of Lyme disease are a bull's eye rash, fever or chills, and fatigue or body aching. Later skin lesions may develop as well as heart, neurological or muscle complications. It is often difficult to diagnose since people often do not notice the tick bite, rashes may not appear, or symptoms imitate other diseases or infections.

To avoid contact with ticks, wear clothing that fully covers the legs, arms, and hands. Avoid walking in wooded or brush-laden areas whenever possible. Inspect the body and clothing during rest periods and immediately remove any ticks found, being careful not to crush them. Have someone else help to inspect the neck, back, head, and other hard-to-see areas of the body. If ticks are found on the body, try to remove

the tick without crushing or leaving any part of the tick in the wound. Use fine-pointed tweezers for tick removal by insertion under the tick. Do not crush the tick on your body or between the fingers. Apply gentle but firm traction on the tick, being careful not to leave the mouthparts in the skin. Do not use force; a slow steady pull is required. Wash hands thoroughly with soap and warm water after handling ticks, apply antiseptic to the wound with iodine, Mercurochrome, or Merthiolate and apply a corticosteroid lotion.

### **3.3.7 Mosquitoes**

Mosquitoes present health hazards primarily due to their potential for transmitting diseases, including Dengue fever and several forms of encephalitis, including St. Louis Encephalitis and West Nile Encephalitis. Recently, mosquitoes have posed an increased risk due to their transmittal of West Nile Virus.

All of the mosquito-borne diseases can cause flu-like symptoms, including fever, headache, and fatigue. Dengue fever can also cause blood hemorrhaging. Encephalitis (including the West Nile, St. Louis, Eastern Equine, and LaCross-California varieties) is an infection of the brain, causing inflammation, swelling, and destruction of nerve cells. Symptoms include high fever, headache, neck stiffness, stupor, disorientation, and tremors; and can lead to convulsions, coma, paralysis, and death. Anyone experiencing several of these symptoms after being bitten by mosquitoes should seek medical attention immediately. There is no vaccine for West Nile Virus.

The best protection from mosquito-borne diseases includes wearing long-sleeved shirts and pants, applying a mosquito repellent containing 20 percent to 30 percent DEET (n,n-diethyl-m-toluamide), and avoiding perfumes and colognes when outdoors for any prolonged time.

## **3.4 Radiological Hazards**

Radiological hazards are not expected for site work.

## **3.5 Ordnance and Explosives Hazards**

Ordnance and explosive materials are not expected for site work. However, if they are discovered at any time during operations, the following requirements will be immediately implemented: stop work operations in the affected area; mark the location; notify onsite personnel of the ordnance and explosives hazard and the area's restrictions; and notify the COR. The COR will coordinate government arrangements for evaluation and proper disposal of devices found.

## **3.6 Dust Control**

Dust will be primarily controlled at work sites using water spray application. If visible dust is observed, dust control measures will be increased to minimize airborne dust.

## **3.7 Activity Hazard Analyses**

AHAs are prepared before beginning each major phase of work operations. The AHA reviews hazards and control measures for primary site tasks. The AHA defines the activities to be performed and identifies the sequence of work, specific hazards anticipated, and control measures to be implemented to eliminate or reduce hazards to an acceptable level. Work does not proceed on that phase of work until the AHA has been accepted and the AHA has been reviewed with personnel involved with the activity. The AHA is reviewed and modified to address changing site conditions or operations. AHA modification occurs with the concurrence of the SHM, PM, Site Superintendent, SSHO, and COR.

AHAs for the following major project tasks are provided in Attachment 3.

- ▲ Mobilization and site preparation
- ▲ Soil excavation, transportation and disposal
- ▲ Sampling and analysis
- ▲ Site restoration and demobilization.

## 4.0 EXPOSURE MONITORING

Air monitoring may be necessary to determine personnel exposures to chemical contaminants and physical agents during various project activities. Air monitoring is conducted field operations where there is potential exposure to combustible gases, oxygen deficiency, or airborne contaminants above OSHA 8-hour time-weighted average (TWA) and 15-minute short-term exposure limit (STEL) PELs or ACGIH TLVs. A description of the plan for exposure monitoring to be implemented, as directed by the SSHO, during the project is provided in this section of the SSHP.

### 4.1 Exposure Monitoring Plan

Air monitoring for airborne dust and PCBs will be conducted during the project. Physiological monitoring for heat stress will be conducted if elevated temperatures are present and impermeable protective clothing is in use. Exposure monitoring plan information is reviewed below and is summarized in Table 3.

Exposure monitoring is conducted by the SSHO or qualified designee. If action level concentrations are exceeded, response actions will be initiated to implement engineering controls, safe work practices, upgrade or downgrade in PPE, work stoppage, emergency evacuation, and notification and evaluation by the PM and SSHO.

The SSHO is responsible for maintaining copies of applicable monitoring records at the site for the duration of the project. Monitoring program data is recorded and maintained by the SSHO on the forms indicated and use described below, as applicable:

Air Monitoring Log: Used to record direct-reading air monitoring instrument results

Calibration Log: Direct-Reading Monitoring Instrument: Used to log instrument calibrations.

### 4.2 Airborne Dust

Airborne dust monitoring will be conducted to measure potential exposures to PCB during PCB-contaminated soil handling (see Attachment 4, Community Ambient Air Monitoring Plan). A PCB equivalent airborne dust action level will be calculated. Airborne dust concentrations exceeding the action level will trigger use of additional dust control measures. The action level will also be used as an upgrade concentration for respirator use by workers.

The PCB equivalent airborne dust action level represents the predicted maximum PCB-containing airborne dust concentrations that could be encountered. Airborne dust action levels are based on the cumulative total of the highest soil sample concentrations of PCB obtained during site assessment soil sampling. The action level is calculated using the following formula:

$$El_{mix} = \frac{(EL \text{ mg/m}^3)}{(\text{Conc. mg/kg}) \times (SF)} = \frac{(10^6 \text{ mg/kg}) \times (EL \text{ mg/m}^3)}{(\text{Conc. mg/kg}) \times (SF)}$$

Where:

- El: Total dust concentration where contaminants would be at their PEL/TLV  
EL: Exposure limit (lowest of PEL or TLV) of specific non-volatile soil contaminant (mg/m<sup>3</sup>)  
10<sup>6</sup>: Conversion factor  
Conc.: Estimated maximum specific contaminant soil concentration (mg/kg)  
SF: Safety factor (1-10X depending upon confidence with soil sampling data)

#### PCB Airborne Dust Equivalent Action Level Calculation:

Since PCB was found in the soil at a maximum concentration of 57 mg/kg, the 8-hour TWA TLV for PCB is 0.5 milligram per cubic meter (mg/m<sup>3</sup>), and a safety factor of 2 is used, the following equivalent airborne dust action level can be calculated.

$$(10^6 \text{ mg/kg}) \times (0.5 \text{ mg/m}^3)$$

$$EL_{mix} = \frac{(57 \text{ mg/kg}) \times (2)}{4,386 \text{ mg/m}^3}$$

Because the high calculated equivalent airborne dust action level, the applicable ACGIH guidelines that would apply are for insoluble or poorly soluble Particles Not Otherwise Specified (PNOS). These guidelines are: less than 3 mg/m<sup>3</sup> for respirable particles and 10 mg/m<sup>3</sup> for inhalable particles.

Airborne dust monitoring will be conducted, using an MIE PdR-1000 aerosol monitor (or equivalent), during PCB-contaminated soil handling. This direct-reading dust monitor is capable of measuring dust with a particle size of 0.1 to 10 micrometer (µm) over a range of 0.01 to 100 mg/m<sup>3</sup>. A Z-bag unit is used for zeroing the instrument under field conditions in accordance with manufacturer instructions.

#### **Airborne Dust Monitoring Action Levels:**

- ▲ Airborne dust concentrations exceed 10 mg/m<sup>3</sup>. ACTION: Stop work. Increase dust control measures. Contact the SSHO to evaluate. Use Level C protection if directed by the SSHO.

### **4.3 Heat Stress Monitoring**

Personnel will be made aware that heat stress can occur during periods of elevated ambient temperatures. This hazard significantly increases with moderate to heavy workloads and when impermeable protective clothing is in use. Personnel will be informed regarding the various forms of heat stress (e.g., heat cramps, heat exhaustion, heat stroke) and the signs and symptoms of exposure. Heat cramps and heat exhaustion initial symptoms are cramps, faintness, dizziness or disorientation, and pale, clammy skin. Heat stroke is an extremely serious medical emergency with sudden onset and symptoms that include dilated pupils, dry and hot skin, loss of consciousness, and convulsions.

Initial phases of work activity are closely monitored to identify personnel who are more susceptible to heat exposure. Workers are responsible for observing each other and themselves for development of heat stress symptoms. Personnel will be encouraged to drink generous amounts of water and electrolyte replacement fluids (even if not thirsty) to prevent dehydration. Adequate shelter will be provided to protect personnel from direct sun exposure. Sufficient breaks will be provided so that personnel can remove protective clothing and cool down.

A monitoring program for heat stress will be implemented for work in elevated ambient temperatures and personnel wearing impermeable protective garments. Work/rest regimens will be established and adjusted as required to avoid heat stress. Heat stress monitoring will be completed for site personnel using impermeable protective clothing when ambient temperatures exceed 70°F.

Heat stress monitoring and establishment of work-rest regimens for heat stress prevention will be completed through physiological monitoring of workers heart rate. Heart rate is determined by measuring the worker's radial pulse rate. Monitoring will be completed at the beginning of work and following each work period.

#### **Heart Rate Monitoring:**

Complete baseline measurements at the start of work before entering the Exclusion Zone (EZ). Measure the heart rate (HR) by counting the radial pulse for a 30-second period and multiply the value by 2 to determine the number of beats per minute (bpm). Following the first work period, measure the HR as early as possible in the resting period. If the HR exceeds 110 bpm, then reduce the next work period by one-third while keeping the length of the rest period the same. Following the next work period, if the HR still exceeds 110 bpm, then again shorten the following work cycle by one-third while keeping the length of the rest period the same. Watch for signs and symptoms of heat stress throughout the work process. Contact the SSHO for an evaluation when a worker's HR exceeds 110 bpm.

### **Heat Stress Monitoring Action Levels: Heart Rate:**

- ▲ HR baseline measurement is greater than, or equal to, 110 bpm. ACTION: Advise the SSHO. Reduce the work cycle by one-third without changing the duration of the rest period. Advise site personnel to continuously observe the condition of the individual and to immediately report signs of heat stress to the SSHO
- ▲ HR measurement following the first work period exceeds 110 bpm. ACTION: Reduce the next work cycle by one-third without changing the duration of the rest period
- ▲ HR measurement following the next work period still exceeds 110 bpm. ACTION: Again reduce the next work cycle by one-third while keeping the length of the rest period the same.

## **5.0 SITE CONTROL**

Site control procedures are established to restrict access to controlled areas of the worksite, identify means for site communication, and establish measures for site security.

### **5.1 Site Work Zones**

Site work zones are established based on the type of operations to be conducted in the work zone, potential for exposure to contaminants, and potential for contact with other safety hazards. The establishment of controlled work zones (i.e., EZ, Contamination Reduction Zone [CRZ], and Support Zone) may be required to limit access to work areas to authorized personnel, prevent the spread of contamination from the work area, establish site communication, and site security measures. Work zone demarcation will be established through use of caution tape or other means (e.g., barricades, fencing, signs) as approved by the SSHO.

#### **5.1.1 Exclusion or Hot Zone**

The EZ is the work zone that represents the area of highest contamination at the site. The EZ will be identified by the SSHO for each work area. The level of protection used within the EZ may vary dependent upon the various work tasks to be conducted and is determined by the SSHO.

#### **5.1.2 Contamination Reduction Zone**

The CRZ is the work zone that represents the transition area between the EZ and the Support Zone at the site. Entry to/exit from the EZ will be through a designated location in the CRZ. Upon exit from the EZ, workers will be required to pass through the CRZ before entering the Support Zone. Personnel decontamination will occur within the decontamination station in the CRZ.

#### **5.1.3 Support Zone**

The Support Zone is the work zone outside of the CRZ that represents the clean areas established at the site. The command post, medical station, equipment and supplies, and other support facilities will be located in the Support Zone. All breaks, lunch, and meetings will take place in the Support Zone. Whenever possible, Support Zone activities will be located upwind of the EZ to reduce the possibility of vapor and/or dust exposures.

### **5.2 Site Control Log**

A log of personnel visiting, entering, or working at the site will be maintained. A "Site Control Log" form will be completed daily. This log includes entries for the date, name, organization, and time entering and exiting the site. The Site Control Log is maintained by the SSHO. All personnel are required to report and sign in at the CAPE field office upon arrival at the site. Personnel who wish to enter a CRZ or EZ at the site must provide to the SSHO copies of required training, medical fitness for duty, and respirator fit testing documentation before site entry is authorized.

### 5.3 Site Communications

Site communications are critical to allow for expedient communication of operational instructions, safety information, and emergency communications, and include:

- ▲ A telephone will be maintained on site with the CAPE Site Superintendent and/or SSHO
- ▲ Emergency communication instructions are found in the emergency response plan section of the SSHP.

### 5.4 Site Security

Site security measures are required to prevent unauthorized access to controlled areas of the site. Site security measures include:

- ▲ Personnel are required to check-in and sign in on the "Site Control Log" before entering controlled areas of the site. Unauthorized persons are not allowed into the controlled areas of the site
- ▲ Temporary fencing, barricades, signs, and/or caution tape will be used for delineation of controlled areas, if needed
- ▲ Protection is required around open holes during off hours (e.g., temporary fencing, barricades with flashing lights and signs/caution tape)
- ▲ Security guard personnel will be provided during nonwork hours at the site if requested by the COR.

## 6.0 **PERSONAL PROTECTIVE EQUIPMENT**

PPE will be required for certain field operations based on the potential for contaminant exposures. The SSHO and SHM will establish appropriate levels of protection for each work activity based on review of historical site information, existing contaminant data, and evaluation of the potential for exposure. The SSHO and SHM will establish action levels for upgrade or downgrade in the initial minimum levels of protection.

PPE requirements will be referenced to the U.S. EPA levels of protection system, consisting of four levels of protection (A-D) as described below:

Level A Protection: Level A protection is worn when the highest level of respiratory, eye, and skin protection is needed. Level A protection is used for initial entry into confined spaces, entry into areas with extensive skin and respiratory hazards, and entry into areas where the hazard of significant exposure to unknown contaminant concentrations exists.

Level B Protection: Level B protection is worn when the highest level of respiratory and eye protection is needed, but a lesser level of skin protection is needed than for Level A. Level B protection is used for initial entry into confined spaces, entry into areas with significant skin and respiratory hazards, and entry into areas where the hazard of significant exposure to unknown contaminant concentrations exists.

Level C Protection: Level C protection is worn when a similar level of skin protection as Level B is needed, but a lower level of respiratory protection is needed. Level C protection is used when limited skin hazards exist and concentrations of contaminants are within the protection factor of an APR.

Level D Protection: Level D protection is worn when minimal protection is needed and activities are not likely to involve direct contact with contaminated materials. Modified Level D protection is used when some skin protection is desired for protection against accidental skin contact with contaminants.

## 6.1 PPE Requirements

It is anticipated that Level D protection use will be required for project activities. Level C protection may be required for some activities. No Level A or B work is expected. The SSHO in coordination with the SHM will determine the need to upgrade from Level D to Level C protection. Level of protection upgrade determinations will be based on the activity being conducted, potential for significant airborne contaminant exposure, and the results of air monitoring.

Levels of protection to be used for the following major project activities are listed below.

Mobilization and Site Preparation (Level D Protection): Level D protection will be used for mobilization of personnel, equipment, and materials to the site and for site preparation activities that do not involve contaminant exposure (i.e., site office set-up, office compound fence installation, utility clearance, construction work area fence installation, work area preparation, clearing and grubbing, erosion control installation, and other site preparation tasks).

Soil Excavation, Transportation and Disposal (Level D and Level C Protection): Level D protection will be used for excavation of PCB-contaminated soil and for waste transportation and disposal. Level C protection upgrade will occur if PCB airborne concentrations or airborne dust concentrations exceed exposure monitoring action levels.

Sampling and Analysis (Level D Protection): Level D protection will be used for air, soil, and dust sampling activities.

Site Restoration and Demobilization (Level D): Level D protection will be used for backfilling, grading, compacting, sod placement, and site restoration work. Level D protection will be used for equipment decontamination before demobilization from the site.

## 6.2 Levels of Protection Description

### 6.2.1 Level C Protection

Level C protection consists of:

- ▲ APR, full-face, or half-face with appropriate cartridge/filter (P-100 for contaminated airborne dust exposure)
- ▲ Disposable coveralls, chemical-resistant (Kleenguard® or Tyvek® for dust exposure; Polyethylene Tyvek®, poly vinyl chloride [PVC], or Saranex® for liquid contact protection)
- ▲ Boots, steel-toed/shank, chemical-resistant (PVC, neoprene, or nitrile blend) with optional boot covers (PVC or latex)
- ▲ Gloves, inner, chemical-resistant (surgical nitrile or latex) and outer, chemical-resistant (nitrile for dexterity; PVC or neoprene for heavy work)
- ▲ Hard hat; safety glasses with side shields (for use with half-face respirator); goggles (for use with half-face respirator when liquid splash hazard present); ear protection (if noise levels more than 85 dBA); and high-visibility safety vest with reflective striping (if vehicle or equipment traffic).

### 6.2.2 Modified Level D Protection

Modified Level D protection consists of:

- ▲ Disposable coveralls (Kleenguard® or Tyvek® for dust exposure; Polyethylene Tyvek® for incidental splash protection)

- ▲ Boots, steel-toed/shank, chemical-resistant (PVC, neoprene, or nitrile blend) or steel-toed work boots (leather) with optional boot covers (PVC or latex)
- ▲ Gloves, inner, chemical-resistant (surgical nitrile or latex) or outer, chemical-resistant (nitrile for dexterity; PVC or neoprene for heavy work)
- ▲ Hard hat; safety glasses with side shields; goggles (if liquid splash hazard); face shield (polycarbonate for pressure washing); ear plugs (if noise levels more than 85 dBA); and high-visibility safety vest with reflective striping (if vehicle or equipment traffic).

### 6.2.3 Level D Protection

Level D protection consists of:

- ▲ Coveralls or standard work clothing
- ▲ Steel-toed work boots (PVC, or rubber)
- ▲ Gloves (PVC or nitrile for soil handling)
- ▲ Hard hat; safety glasses with side shields; face shield (polycarbonate for pressure washing); ear plugs (if noise levels more than 85 dBA); and high-visibility safety vest with reflective striping (if vehicle or equipment traffic).

## 6.3 Respiratory Protection

Respiratory protection will be selected, used, and maintained in accordance with the CAPE Safety and Health Program Respiratory Protection Standard Operating Procedure (SOP). Respiratory protection requirements include:

- ▲ The SSHO is responsible for ensuring workers have had required medical examinations, respirator training, and respirator fit testing within the past year; and that copies of certifications are maintained and available according to OSHA recordkeeping requirements
- ▲ Facial hair is not allowed that interferes with respirator fit
- ▲ Personnel using APRs must have passed a qualitative fit-test within the past year. Qualitative fit testing will be conducted by the SSHO as needed and will be documented. A positive and negative pressure respirator user seal check will be completed each time a respirator is put on
- ▲ A licensed physician must evaluate respirator users and provide a written fitness for duty statement that the worker may safely use a respirator
- ▲ When respirators are required, personnel will not remove a respirator in a controlled work zone or enter these work zones without a respirator
- ▲ Visitors will be required to provide documentation of respiratory protection instruction and fit testing for entry into controlled work zones with required respirator use.

## 6.4 PPE Maintenance

Personnel are responsible for appropriate maintenance of PPE. CAPE will provide supplies, materials, and facilities needed by personnel for proper PPE maintenance. PPE maintenance requirements include:

- ▲ PPE requirements are determined by the SSHO in accordance with the SSHP
- ▲ Personnel are responsible for proper use of required PPE
- ▲ Torn protective clothing or damaged PPE will be immediately repaired or replaced
- ▲ Contaminated PPE will be disposed of properly (as contaminated waste)

- ▲ Maintenance of reusable personal issue PPE (e.g., hard hats, safety glasses, steel-toed PVC boots) is the responsibility of each worker for individually assigned equipment
- ▲ Personnel are responsible for proper maintenance, cleaning, storage, and use of individually assigned respirators. Respirators will be cleaned after each use, placed in a plastic bag, and inspected before using again.

## 7.0 DECONTAMINATION

Personnel and equipment decontamination measures will be required for site work.

### 7.1 Personnel Decontamination

General personnel decontamination requirements include:

- ▲ The SSHO must review specific decontamination procedures with personnel required to enter controlled work zones of the site and will monitor and ensure use of prescribed decontamination procedures
- ▲ Personnel will be instructed to minimize contact with contaminants, to the extent feasible, to reduce the potential for personal or equipment contamination
- ▲ Personnel decontamination occurs at the decontamination station established within the CRZ for each work location. Decontamination activities occur in the CRZ after working in the EZ and before entrance into the Support Zone
- ▲ Personnel must clean, remove, and place contaminated disposable protective clothing in marked containers before leaving the CRZ
- ▲ Workers will be instructed to practice good personal hygiene by washing the face, hands, and forearms before eating, drinking, smoking, etc.

#### 7.1.1 Decontamination Procedures – Dry Method

A dry decontamination method will be used when there is limited contact with contaminants and when the SSHO has determined that a wet decontamination method is not needed. The decontamination sequence will be completed as follows:

Station 1 - Equipment Drop: Deposit used equipment on sheet plastic or in container with plastic liner.

Station 2 - Outer Boot Covers and Outer Gloves Removal: Remove outer boot covers and outer gloves. Deposit in container with plastic liner.

Station 3 - Boots and Outer Garment Removal: Remove boots and suit and deposit in containers with plastic liners.

Station 4 - Respirator Face Piece and Inner Gloves Removal: Remove respirator face piece (avoid touching face with fingers) and deposit on sheet plastic or in plastic bag. Remove inner gloves.

Following dry decontamination, personnel should immediately proceed to the nearest available facilities and thoroughly wash hands and face, before eating, drinking, or smoking.

#### 7.1.2 Decontamination Procedures – Wet Method

A wet decontamination method will be used when there is significant contact with contaminants (i.e., contact with liquid contaminants, muddy surface contamination, other heavy contamination) and when the SSHO has determined it is necessary. The decontamination sequence should be completed as follows:

Station 1 - Equipment Drop: Deposit used equipment on sheet plastic or in container with plastic liner.

Station 2 - Boots and Outer Garments Wash/Rinse: Scrub outer boots, outer gloves, and suit with detergent/water solution. Rinse off with water.

Station 3 - Outer Boot Covers and Outer Gloves Removal: Remove outer boot covers and outer gloves. Deposit in container with plastic liner.

Station 4 - Cartridge/Canister or Mask Change-Out: Change-out APR cartridges/canister or face piece as needed. For respirator change-out and return to EZ, don new outer gloves and boot covers, tape at joints, and return to EZ. For entry into the support zone, continue decontamination sequence.

Station 5 - Boots and Outer Garment Removal: Remove boots and suit and deposit on sheet plastic or in containers with plastic liners.

Station 6 - Respirator Face Piece and Inner Gloves Removal: Remove respirator face piece (avoid touching face with fingers) and deposit on sheet plastic or in plastic bag. Remove inner gloves.

Station 7 - Field Wash: Wash hands and face thoroughly.

## **7.2 Equipment Decontamination**

Procedures are required to prevent the spread of contamination from vehicles and equipment used in the EZ into Support Zone and offsite areas. Equipment will be decontaminated by procedures established by the SSHO.

### **7.2.1 Equipment Decontamination Facilities and Procedures**

A decontamination facility (decontamination pad) may be established for decontamination of vehicles and equipment. Equipment will be decontaminated by procedures established by the SSHO and include:

- ▲ Vehicle and equipment use in the EZ and contact of their tires/tracks with contaminated surfaces will be minimized to the extent possible
- ▲ Dirt will be brushed or scraped off of vehicles and heavy equipment to remove visible materials before moving from the CRZ off site. As needed, a pressure washer will be used for equipment decontamination
- ▲ Following decontamination, the equipment will be inspected and an "Equipment Decontamination Release Authorization" form will be prepared by the SSHO to document decontamination, before equipment will be allowed to move off site.

## **8.0 ACCIDENT PREVENTION PLAN, SAFETY POLICY AND PROCEDURES**

A site-specific APP that has been prepared to meet EM 385-1-1 Appendix A requirements has been prepared for this project. Safety policy, safe work practices, SOPs, and required safety control measures are presented in this section of the SSHP.

### **8.1 Safety Policy**

It is the policy of CAPE to perform work activities in a safe manner. Our safety goal at CAPE is to have incident-free operations. This goal can only be achieved through total and demonstrated commitment to this safety policy from each individual CAPE staff member.

The effective realization of this policy and goal depends on three elements:

- ▲ Every accident is preventable
- ▲ Effective safety training is provided so that every CAPE staff member has the necessary knowledge to identify potential hazards to their own and their co-workers' safety, and the necessary protocols, tools and equipment to appropriately mitigate the identified hazards
- ▲ Each CAPE staff member understands that we are each accountable for maintaining our own safety and the safety of our co-workers, at all times and in all situations.

The CAPE Safety and Health Program:

Defines procedures and responsibilities necessary to effectively implement this safety policy  
Establishes a basis for safety training, medical monitoring and recordkeeping requirements  
Provides rewards for safe work performance via project specific safety incentive programs  
Defines proper safety practices to be used during the performance of our work  
Complies with governmental regulations in the implementation of safe work practices.

## **8.2     Standard Work Procedures**

### **8.2.1     General Safe Work Practices**

Site personnel must work in a safe manner. Standard work procedures for site work include, but are not limited to, the following:

- ▲ Personnel must report to work in a ready-to-work state
- ▲ Personnel must report to work in suitable work clothing.
- ▲ Illicit drugs and alcohol are not allowed on site
- ▲ Firearms are not allowed on site
- ▲ Horseplay is not allowed on work sites

### **8.2.2     Hazard Communication**

- ▲ The SSHO will maintain copies of MSDSs for hazardous substances to be used during project work
- ▲ Site personnel will be informed of the hazardous substances they will be working with through SSHP review and attendance at daily safety meetings
- ▲ Refer to the CAPE "Hazard Communication Program" SOP for additional guidance and requirements.

### **8.2.3     Reporting of Hazards and Safety Inspections**

- ▲ Site personnel are encouraged to immediately report unsafe work conditions or unsafe work practices observed to their supervisor and the SSHO without fear of reprisal
- ▲ The Site Superintendent and the SSHO will conduct periodic safety inspections at the site to identify and correct hazards.

### **8.2.4     Visitors**

- ▲ Visitors must have approval from the COR and PM before entering controlled areas of the site

- ▲ Visitors must meet applicable medical and training requirements and review pertinent aspects of the SSHP.

#### 8.2.5 Illumination

Illumination requirements include those contained the OSHA 29 CFR 1910.120 and 29 CFR 1926.65 "Hazardous Waste Operations and Emergency Response" standards and in the EM 385-1-1 Section entitled "Lighting." In the absence of adequate lighting (5 to 10 foot-candles) at outdoor construction locations, portable lights, or light stands will be used to illuminate work areas.

#### 8.2.6 Sanitation

Sanitation requirements include those contained in the EM 385-1-1 Section entitled "Sanitation." Sanitation procedures include:

- ▲ Food, beverages, tobacco products, or cosmetics are not allowed in contaminated areas or potentially contaminated areas. Eating, drinking, chewing gum or tobacco, and smoking are allowed only in designated areas
- ▲ Good personal hygiene and decontamination practices will be followed at all times
- ▲ Site washing facilities will be provided at the job location and personnel will be required to wash their hands and face when exiting the EZ (field wash station) and before breaks and lunch
- ▲ Drinking water will be provided to workers in disposable bottles or portable drinking water dispensers with lids and a tap. Dispensers will be clearly marked "Drinking Water" and will not be used for other purposes. Individual disposable cups will be used. Use of a common cup or dipping from the container is prohibited. Disposable cups will be stored in a sanitary container and a waste receptacle will be available for used cups and empty disposable bottles
- ▲ Portable toilets will be readily available at the job location or a vehicle (not the emergency vehicle) will be available to transport workers to nearby toilet facilities.

#### 8.2.7 Safety Inspections

Requirements for safety inspections are contained in the EM 385-1-1 Section entitled "Program Management." Safety inspection procedures include:

- ▲ The SSHO will complete daily safety inspections of work sites to identify and correct hazards. Other contractor quality control personnel may also conduct and document safety inspections
- ▲ The SSHO will record any identified safety and health issues and deficiencies, and will indicate the actions, timetable, and responsibility for correction of deficiencies on the CAPE "Safety Inspection Report" form, or equivalent. The SSHO will conduct follow-up inspections to ensure identified deficiencies have been corrected, and will document these inspections in a like manner.

#### 8.2.8 Incident Reporting and Investigation

The COR must receive immediate verbal notification and written notification within 24 hours for incidents involving a serious injury, explosion, fire, or a spill/release of toxic materials. Important requirements for incident reporting and follow-up are described below.

- ▲ Employees must immediately report all incidents, injuries and illnesses, property damage, liability exposure cases, spills, fires, and serious near miss incidents to their supervisor or the SSHO
- ▲ In the event of a serious incident, supervisors are responsible for notifying the Site Superintendent and SSHO, who in turn are responsible for notifying the CAPE PM, SHM, Corporate Risk Manager, and Corporate Health and Safety Manager (CHSM). The CHSM should be contacted

immediately in injury or illness cases to assist with coordination of required medical assistance and related workers' compensation case management follow-up

- ▲ If a serious injury occurs during the project, the Site Superintendent and SSHO will immediately report the incident to the PM, SHM, COR, and the appropriate government agencies. CAPE will give the COR verbal notification immediately following a lost workday injury, followed by a written notification within 24 hours using ENG FORM 3394, USACE Accident Investigation Report
- ▲ The SSHO and the supervisor(s) responsible for an activity involved in an incident will participate in a complete investigation, and will inspect the area or equipment involved (as applicable). This includes completion and filing of ENG FORM 3394, USACE Accident Investigation Report with the COR; and completion and filing of an "Incident Report by Supervisor," "Incident Statement by Employee," "Incident Statement by Witness," "Injury and Illness Report," "Property Damage, Loss, and General Liability Report," and "Vehicle Accident Report," as applicable, with the SHM within 24 hours of the injury (immediately for a serious injury or fatality)
- ▲ The CHSM and the SHM must be notified immediately of any incident involving hospitalization of three employees or a fatality. The CHSM and the SHM will conduct an immediate investigation. The CHSM and the SHM are responsible for notifying the jurisdictional OSHA office as soon as possible and no later than 8 hours of the accident. (Note: This notification includes weekend days as 24-hour emergency reporting access is available.) The CHSM and the SHM will act as the agency interface upon their investigation. The report to OSHA must include: time and date of accident; employer's name, address, and telephone number; name and job title of person reporting the accident; address of the site of the accident; name of person to contact at the site of the accident; name and address of any injured employee(s); nature of injury; location where the injured employee was moved to; list and identity of other law enforcement agencies present at the site of the accident; and description of the accident and whether the accident scene has been altered
- ▲ The SSHO, with the assistance of the PM and Site Superintendent, will obtain a doctor's first report of injury for every injury or illness requiring medical treatment and will immediately forward to the CHSM
- ▲ An injured worker is not allowed back to work until a return-to-work notice issued by the treating physician and negative drug and alcohol test documentation (as applicable) are presented to the SSHO. Any injured worker issued a work restriction shall be under the direct supervision of the SSHO and shall be assigned work activities within the restriction until a full duty status clearance has been received
- ▲ The CHSM will make a telephone report for all claims covered under the CAPE Workers' Compensation Policy. Reports are made to the workers' compensation insurance claim-reporting center where an employer's first report of injury or illness form is completed over the phone. After reporting a claim to the reporting center, the information is faxed by the reporting center to the claims service office to handle the claim. Any subsequent medical bills and reports received for the claim are forwarded to the CHSM who will subsequently mail them to the claims service office
- ▲ When a worker returns to work after an injury or illness, the CHSM will contact the claims servicing office to advise them of the actual date of return to work. Questions or inquiries are to be directed to the CHSM who will contact the claims service office or the CAPE insurance company, as needed
- ▲ The CHSM records each injury or illness on the OSHA Form No. 300 "Log of Work Related Injuries and Illnesses" and the OSHA Form 300A "Summary of Work-Related Injuries and Illnesses." The OSHA 300 form is posted annually no later than February 1 (of the following year) and is kept posted for 3 months (until April 30).

### 8.2.9 Safety Rule Enforcement

Workers must obey directives from the SSHO. The PM and SSHO may immediately dismiss personnel from the site who do not comply with safety requirements. Site personnel must strictly adhere to established safe work practices and work procedures. Violation of a safety procedure or rule may result in disciplinary action in accordance with the severity of the infraction. The PM, Site Superintendent, or SSHO will report unsafe work performance to company management. Disciplinary action may include the following, depending upon the severity of the safety infraction:

- ▲ Verbal warning
- ▲ Written warning notice
- ▲ Termination of employment
- ▲ Other disciplinary action.

### 8.3 Standard Operating Procedures

The CAPE Safety and Health Program presents written S&H procedures that establish protocol for implementation of specific safety programs. Compliance with these SOPs is mandatory and includes:

- I. Introduction
- II. Safety Responsibilities
- III. Employee Training
- IV. Safety Meetings
- V. Accident and Injury Investigation Program
- VI. Emergency Action Plan
- VII. Hazard Communication Program
- VIII. Medical Monitoring
- IX. Respiratory Protection Program
- X. Site Safety and Health Plan
- XI. Air Monitoring
- XII. Safety Equipment
- XIII. Confined Space Program
- XIV. Lockout/Tagout Procedure
- XV. Electrical Hazards
- XVI. Fall Protection
- XVII. Ladders and Scaffolding
- XVIII. Excavation
- XIX. Temperature Stress Program
- XX. Bloodborne Pathogens Exposure Control Plan
- XXI. Hearing Conservation Program
- XXII. Fleet Safety
- XXIII. Heavy Equipment/Drill Rig Safety
- XXIV. Water Safety Program
- XXV. Recordkeeping.

## 9.0 EMERGENCY RESPONSE PLAN

Emergency/contingency plans will be established to address possible site emergencies. For major emergency events (e.g., large fires, gas line or electrical line breaks, etc.) personnel will be evacuated to a designated refuge area and local fire, police, or emergency medical service personnel will be notified. The COR, PM, Site Superintendent, and SSHO will work cooperatively to resolve emergency events. All site personnel are required to immediately notify the SSHO, Site Superintendent, or PM immediately in the event of any type of site emergency.

## 9.1 Site and Emergency Communications

- ▲ Cellular telephones will be used for site and emergency communications. If not available, the closest land line telephone will be located before work is initiated
- ▲ The CAPE SSHO will maintain an "Emergency Contact List" (Attachment 1). The SSHO is responsible for confirming the emergency hospital and the route to the emergency hospital from the SSHP before the start of field operations
- ▲ The SSHO will establish emergency communications procedures before the start of site work and will convey this information to site personnel during site orientation briefings and safety meetings.

## 9.2 Emergency Supplies

Emergency supplies will be immediately available at the site and will include:

- ▲ First-aid kit
- ▲ Fire extinguisher
- ▲ Supply of potable clean water
- ▲ Spill kit supplies.

## 9.3 Emergency Hospital and Route Information

The SSHP includes an emergency hospital and the route to the emergency hospital (see Attachment 1). The SSHO will confirm or correct the emergency hospital and route before site work begins. The designated emergency hospital name, contact information, and route map will remain on site during field operations.

## 9.4 Response to Fire Incident

The SSHO will consult with the local fire department before initiating site activities regarding response to fire incidents associated with site work. In the event of a fire, the following will be implemented:

- ▲ Large fire (beyond the immediate control of a small onsite fire extinguisher): The site alarm will be sounded, personnel will immediately evacuate and assemble at a predetermined upwind site location, and the SSHO or Site Superintendent will call the fire department; personnel will not reenter the fire area and will wait for fire department arrival
- ▲ Small fire (within the immediate control of a small onsite fire extinguisher): The site alarm will be sounded and trained personnel will use an onsite fire extinguisher to put out the fire.

## 9.5 Response to Chemical Spill Incident

A spill kit will be available on site with supplies for spill containment and control. The spill kit will include absorbent pads, solid absorbent, and a container.

In the event of a small chemical spill incident, the Site Superintendent and SSHO will be immediately notified. They will immediately report the incident to the PM and SHM. If containment can be performed safely without exposure to personnel, the following will be implemented:

- ▲ Containment of liquid chemical spills is accomplished through prompt application of absorbents (e.g., absorbent pads or solid absorbent) to the spilled liquid chemical
- ▲ Containment of solid chemical spills is accomplished by covering with sheet plastic (or by an equivalent method). Spilled material is collected in bags, drums, or other suitable containers and disposed of as required.

In the event of a large uncontrolled chemical spill incident, the Site Superintendent and SSHO will be immediately notified. They will immediately notify the local fire department, and report the incident to the PM and SHM. The PM and SHM will contact the COR and appropriate government agencies (i.e., National Response Center, EPA, etc.). The SSHO will obtain information regarding the spill and will respond immediately to the spill location.

#### **9.6     Response to Medical Emergency Incident**

In the event of a medical emergency, the following procedures will be implemented:

- ▲        The exposed or injured person will be removed from immediate danger
- ▲        Trained site personnel will administer first-aid and/or CPR (a minimum of two trained and certified first-aid/CPR personnel are required to be present on site at all times)
- ▲        Emergency medical assistance will be called and will be informed of the following: name and location of person reporting; location of accident or incident; specific directions to the emergency location, as needed; telephone number from which the person is calling; number persons needing help; what is currently being done for the victim (for life-threatening injuries, request instructions from emergency services dispatcher); name and affiliation of injured party; description of injuries; details of any chemical involved; summary of the accident, including suspected causes and time of occurrence; and temporary control measures taken to minimize further risk
- ▲        Nonessential personnel will be evacuated from the work area until the SSHO determines it is safe for work to resume
- ▲        A medical emergency involving chemical exposure will require communication between the SSHO and emergency hospital personnel regarding chemicals involved
- ▲        The SSHO will designate an individual to accompany or follow the victim to the emergency hospital to assist with any needs that arise and to report back regarding the victims status.

### **10.0     TRAINING**

Copies of S&H training certificates will be reviewed and maintained by the SSHO. Personnel will not be allowed to perform fieldwork until the SSHO has determined this documentation to be complete and sufficient.

#### **10.1     Pre-Construction Safety Conference**

A preconstruction safety conference will be held prior to the start of site work. The COR and representatives will meet with CAPE to review and discuss requirements associated with planning and administration of the project safety program. The purpose of the meeting will be to discuss how work will be implemented including, but no limited to, work procedures and safety considerations, equipment to be used, training required to operate equipment, and safety requirements such as training and safety equipment

#### **10.2     HazWOPER Training**

Personnel involved in hazardous waste activities at the site must have completed hazardous waste operations and emergency response (HazWOPER) training as required by the OSHA "Hazardous Waste Operations and Emergency Response" standard. Certificates of HazWOPER training will be maintained by the SSHO at the site. Copies of current training certification statements will be submitted before initial entry onto the work site. Required HazWOPER training includes the following:

- ▲ Worker Training: 40 hours of initial training and 3 days of supervised field experience
- ▲ Manager and Supervisor Training: 8 hours of additional specialized manager/supervisor training
- ▲ Refresher Training: 8 hours of refresher training annually.

### **10.3 Site Orientation Briefing**

Before the start of work, the SSHO will provide a site orientation briefing to workers related to project operations and SSHP requirements. The briefing will include review of (as applicable):

- ▲ Provisions of the SSHP
- ▲ Facility background and SOW
- ▲ Key personnel and S&H responsibilities
- ▲ Site hazards anticipated
- ▲ Exposure monitoring program
- ▲ Site control procedures
- ▲ PPE requirements
- ▲ Procedures for reporting unsafe conditions or unsafe work practices
- ▲ Procedures for reporting an injury/illness
- ▲ Emergency procedures including warning signals and evacuation procedures
- ▲ Location/Route to the emergency hospital
- ▲ Training requirements
- ▲ Medical surveillance requirements
- ▲ Recordkeeping procedures.

New workers must receive a site orientation briefing and review the SSHP before start of work. Personnel will sign a form documenting that they have reviewed the plan, understand the SSHP requirements, and agree to follow the plan.

### **10.4 Daily Safety Meetings**

Daily safety meetings will be conducted at the beginning of each work shift to discuss operational tasks to be completed and pertinent site safety topics. Meetings will be documented and those in attendance will be required to sign the "Tailgate Safety Meeting Record" or equivalent form.

### **10.5 Monthly Supervisor Safety Meetings**

Supervisor safety meetings will be held at least once a month for all supervisors on the project location. The SHM and/or SSHO will conduct the safety meeting and will discuss safety-related issues directed toward supervisor responsibilities. Meetings will be documented and attending personnel will sign a "Safety Meeting Attendance Roster." Safety meeting forms will be maintained by the SSHO and copies will be furnished to the COR upon request.

### **10.6 First-Aid/CPR Training**

Selected site personnel will have current certification in first aid and CPR training to assist in initial handling of emergency medical incidents. At least two persons who are currently certified in first-aid and CPR by the American Red Cross or other approved agency must be on site at all times during site operations. These individuals may perform other duties at the site but must be immediately available to render first-aid or CPR when needed.

### **10.7 10-Hour OSHA Construction Safety and Health Training**

As required by USACE EM 385-1-1, personnel who are assigned as an SSHO shall have attended a 10-Hour OSHA Construction S&H Training class within the last three years. An equivalent course applicable to the work to be performed (i.e., OSHA 500 Trainer Course in Occupational S&H for the Construction Industry) is considered acceptable. Class topics that may be reviewed during the 10-hour OSHA Construction S&H class include:

- ▲ Introduction to OSHA (mandatory topic)
- ▲ Electrical, Subpart K (mandatory topic)
- ▲ Fall Protection, Subpart M (mandatory topic)
- ▲ Personal Protective and Lifesaving Equipment, Subpart E (optional topic)
- ▲ Materials, Handling, Storage, Use and Disposal, Subpart H (optional topic)
- ▲ Tools – Hand and Power, Subpart I (optional topic)
- ▲ Scaffolds, Subpart L (optional topic)
- ▲ Cranes, Derricks, Hoists, Elevators, and Conveyors, Subpart N (optional topic)
- ▲ Excavations, Subpart P (optional topic)
- ▲ Stairways and Ladders, Subpart X (optional topic)
- ▲ Other construction industry hazards or policies (optional topics).

## 10.8 **Excavation Competent Person Training**

Employee training in excavation safety procedures is necessary to acquire understanding, knowledge, and skills necessary for safe performance of excavation operations. Excavation safety training is required for those individuals that act as an OSHA Competent Person for trenching and excavation operations. Competent persons must be knowledgeable in the OSHA "Excavation" standard (29 CFR 1926 Subpart P). Excavation safety training involves review of:

- ▲ OSHA excavation standards
- ▲ Excavation safety hazards
- ▲ Soil analysis methods and classifications
- ▲ Protective systems for excavation safety
- ▲ Duties, authority, and responsibilities of the Competent Person.

## 11.0 **MEDICAL SURVEILLANCE**

Medical surveillance requirements exist for site personnel who will be working in any potentially hazardous locations. Medical surveillance requirements include baseline, annual, reassignment, and termination (exit) medical examinations. Required medical qualification documentation consists of a written physician opinion regarding any detected medical conditions that may limit an individual's ability to perform hazardous waste remediation activities and an opinion regarding protective clothing and respirator use. Copies of medical surveillance examination reports for site personnel will be reviewed by the SHM and SSHO and maintained by the SSHO. They will be made available to the COR as required. Personnel will not be allowed to perform fieldwork until the SSHO has determined this documentation to be complete and sufficient.

### 11.1 **Medical Examinations and Reports**

CAPE medical examinations for field personnel are completed before job assignment and annually thereafter. CAPE uses WorkCare, Inc. to provide occupational physician support services. WorkCare physicians are American Board of Preventive Medicine, Board-Certified (or Board-Eligible).

The CAPE standard medical examination protocol consists of the following: medical and occupational history, comprehensive physical examination, vision test, audiometric testing, pulmonary function tests (FVC and FEV 1.0), complete blood count with differential, urinalysis with microscopic examination, blood chemistry panel, chest X-ray (every 3 years for persons 40 years and younger; yearly for persons over 40 years old), and electrocardiogram (yearly for persons over 40 years old).

Medical examination reports for site personnel are presented in the form of work status medical reports. These reports indicate any detected medical conditions that would increase an individual's risk of material health impairment from occupational exposure or the use of PPE, such as protective clothing or respirators. Copies of medical examination reports for site personnel will be maintained by the SSHO and will be provided to the COR as required.

## 11.2 Drug and Alcohol Testing Program

CAPE has a substance abuse policy that establishes requirements for a drug-free workplace and pre-employment drug testing. CAPE requires that post-accident drug and alcohol testing be conducted when employees have caused or contributed to an on-the-job injury resulting in loss of work time or damage to property. Post-accident drug and alcohol testing must be conducted immediately following a job-related injury or accident. If there are extenuating circumstances preventing an employee receiving drug and alcohol testing immediately, the testing must be conducted within 24 hours of the incident. Workers are not allowed back to work until the SSHO receives documentation of a negative drug and alcohol test report.

## 12.0 **RECORDKEEPING**

S&H documentation records associated with implementation of SSHP requirements are maintained by the SSHO. S&H documentation records, as applicable, include: material safety data sheets; S&H training documentation; medical surveillance examination documentation; respirator fit testing forms; SSHP review and safety meeting records; safety inspection reports; equipment inspection forms; confined space entry permits; hot work permits; exposure monitoring records and employee notifications; accident reporting and investigation records; and other S&H documents.

### 12.1 Site Safety and Health Plan Forms

Completed SSHP forms are maintained on site by the SSHO for the duration of the project. SSHP forms that may be used during the project are indicated below:

- ▲ Accident Prevention Plan Review
- ▲ Activity Hazard Analysis Preparatory Phase Training Log
- ▲ Air Monitoring Log
- ▲ Calibration Log: Direct-Reading Monitoring Instrument
- ▲ Certificate of Worker/Visitor Acknowledgment
- ▲ Emergency Medical Notification Form
- ▲ Equipment Decontamination Release Authorization
- ▲ Excavation Safety Checklist
- ▲ Hazardous Substance Inventory List
- ▲ Heavy Equipment Inspection Report
- ▲ Incident Reporting and Investigation Procedures Posting
- ▲ Incident Reporting and Investigation Protocol Posting
- ▲ Incident Report by Supervisor
- ▲ Incident Statement by Employee
- ▲ Incident Statement by Witness
- ▲ Injury and Illness Report
- ▲ Property Damage, Loss, and General Liability Report
- ▲ Safety Inspection Report
- ▲ Safety Meeting Attendance Roster
- ▲ Site Control Log
- ▲ Site Safety and Health Plan Distribution to Subcontractor
- ▲ Site Safety and Health Plan Review
- ▲ Tailgate Safety Meeting Record
- ▲ Training Attendance Roster
- ▲ USACE Accident Investigation Report (ENG Form 3394)
- ▲ Vehicle Accident Report.

## TABLES

**CHEMICAL HAZARD INFORMATION**

Compound	Exposure Limits	Primary Health Effects / Other Comments
Polychlorinated biphenyl, 42% and 54% chlorine) (PCB)	1 mg/m <sup>3</sup> (TLV-TWA) (SKIN) - 42% chlorine PCB; 0.5 mg/m <sup>3</sup> (TLV-TWA) (SKIN) - 54% chlorine PCB	Inhalation, ingestion and dermal routes of exposure. Eye, skin, and respiratory irritation; Chloracne dermatitis; Possible liver damage; Suspected carcinogen

**LEGEND:**

mg/m<sup>3</sup>: Milligrams per cubic meter  
 TLV-TWA: American Conference of Governmental Industrial Hygienists (ACGIH) 8-hour time-weighted average (TWA) Threshold Limit Value  
 SKIN: Skin notation (may be absorbed into the bloodstream through the skin, mucous membranes and/or eye, and contribute to the overall exposure)

Page 2  
PHYSICAL HAZARD INFORMATION

Physical Hazard	Site Work Application and Discussion
Fire Protection	Gasoline and diesel fuel will be used for vehicles, heavy equipment, and machinery operation. Hot work is <u>not</u> expected during site work. Fire extinguishers will be on site. Bonding and grounding will be used for combustible liquid transfers.
Underground and Overhead Utilities	Underground and/or overhead utilities may be present at the site. Subsurface work will require utility clearance procedures. The presence of overhead utilities will be surveyed before bringing equipment with high extensions (i.e., heavy equipment, dump trucks) into a work area.
Heavy Equipment Operation	Heavy equipment will be needed to perform excavation and earthmoving activities. Heavy equipment will be inspected daily and documented. Ground personnel will position themselves out of the swing radius of operating heavy equipment. Personnel will <u>not</u> be allowed to walk underneath loaded buckets. Ground personnel will wear high-visibility vests with reflective striping and be required to maintain visual contact with equipment operators. Hand signals will be established.
Excavation and Trench Safety	Excavation operations requiring personnel entry into trenches 4 feet or more in depth or excavations 5 feet or more in depth, if needed, will be completed according to OSHA requirements. For these operations, a "Competent Person" will supervise operations, conduct daily inspections, and implement protective systems for excavation operations (sloping, benching, shielding, and/or shoring) if soils are <u>not</u> sufficiently stable.
Vehicle and Equipment Traffic	Concurrent use of heavy equipment, vehicles, and ground personnel will occur during site work. Traffic patterns will be established for truck traffic as needed. Personnel will wear high visibility safety vests with reflective striping when working near traffic areas. Spotters will be used if needed for backing of vehicles into tight work areas.
Material Handling	Material handling involving lifting and carrying will be needed. Personnel will review proper lifting techniques during safety meetings.
Tools, Machinery, and Equipment Use	Hand and power tools such as drills, saws, and wrenches may be used. Tools will be used according to design. Power tools requiring electrical cords will use GFCIs.
Electrical Equipment and Lockout/Tagout	Generators may be used to provide electrical power on site. GFCIs will be used and electrical extension cords inspected should portable electrical equipment be needed. Lockout/Tagout of electrical equipment for maintenance and servicing is <u>not</u> expected but will be completed if needed.
Noise Exposure	Noise exposure above 85 dBA is expected when working near or operating machinery and equipment (i.e., heavy equipment, generators, compressors). Earplugs will be used for protection.
Heat Stress	Heat stress may occur when elevated ambient temperatures, moderate to heavy workloads, and/or use of impermeable protective clothing occur. Provisions will be made to establish break areas, provide fluids, and adjust work-rest schedules as needed.
Cold Stress	Cold stress may occur upon exposure to cold environments where there is heat loss to the body and extremities. Provisions will be made to minimize exposure to cold temperatures and/or ensure personnel wear insulating clothing.
Pressure Washer Operation	Pressure washer equipment may be used for equipment decontamination. Face and eye protection will be used for splash protection.
Chain Saw Operation	Chain saws will be used during site work. Safety procedures for proper use of this equipment will be required.
Tree Removal Operations	Tree removal operations may be conducted. Tree felling requires strict safety procedures. Survey the work area, surrounding area, tree characteristics, and look for utilities, equipment, or people in the area. Clear the work area before tree felling. Cut using a notch and back cut method for large trees. Give an audible warning when the tree is ready to fall.
Wood Chipper Operation	Wood chipper equipment may be used. Wood chipper equipment safety procedures include use of eye and hearing protection. Do <u>not</u> place any part of your body into the feed table when the chipper is in operation. Do <u>not</u> wear loose clothing that could get caught in equipment.
Inclement Weather and Adverse Environmental Conditions	Strong wind, heavy rain, or lightning provisions will be made to suspend outdoor operations during inclement weather conditions.
Miscellaneous Physical Hazards	General safety hazards will be present during all site tasks. Use of hand tools, power tools, and material handling/lifting of materials are primary hazards. General safety information will be communicated during daily safety meetings.

Page 3  
**EXPOSURE MONITORING PLAN**

Exposure Element	Method	Tasks	Frequency	Action Levels	Action
Airborne Dust - Worker exposure monitoring	MIE PdR-1000 aerosol monitor, or equivalent	During excavation and loading of PCB-contaminated soil	Representative area and/or worker monitoring	Greater than 10 mg/m <sup>3</sup>	Stop work. Increase dust control measures. Contact the SSHO to evaluate. Use Level C protection if directed by SSHO
Heat stress	Radial pulse for heart rate	Tasks where elevated ambient temperatures (greater than 70°F), moderate to heavy work loads, and impermeable protective clothing is being used	Initial baseline before first entry into the Exclusion Zone and periodic monitoring at the end and beginning of each work period in the Exclusion Zone	Baseline: HR greater than 110 bpm  Next: HR greater than 110 bpm  HR slow recovery to less than 110 bpm	Reduce next work period by one-third.  Reduce next work period by one-third.  Alert SSHO to evaluate.

**LEGEND:**

mg/m<sup>3</sup>: Milligrams per cubic meter  
°F: Degrees Fahrenheit  
HR: Heart rate measured by checking radial pulse rate  
bpm: Beats per minute.

## FIGURES

FIGURE 1  
SITE VICINITY MAP

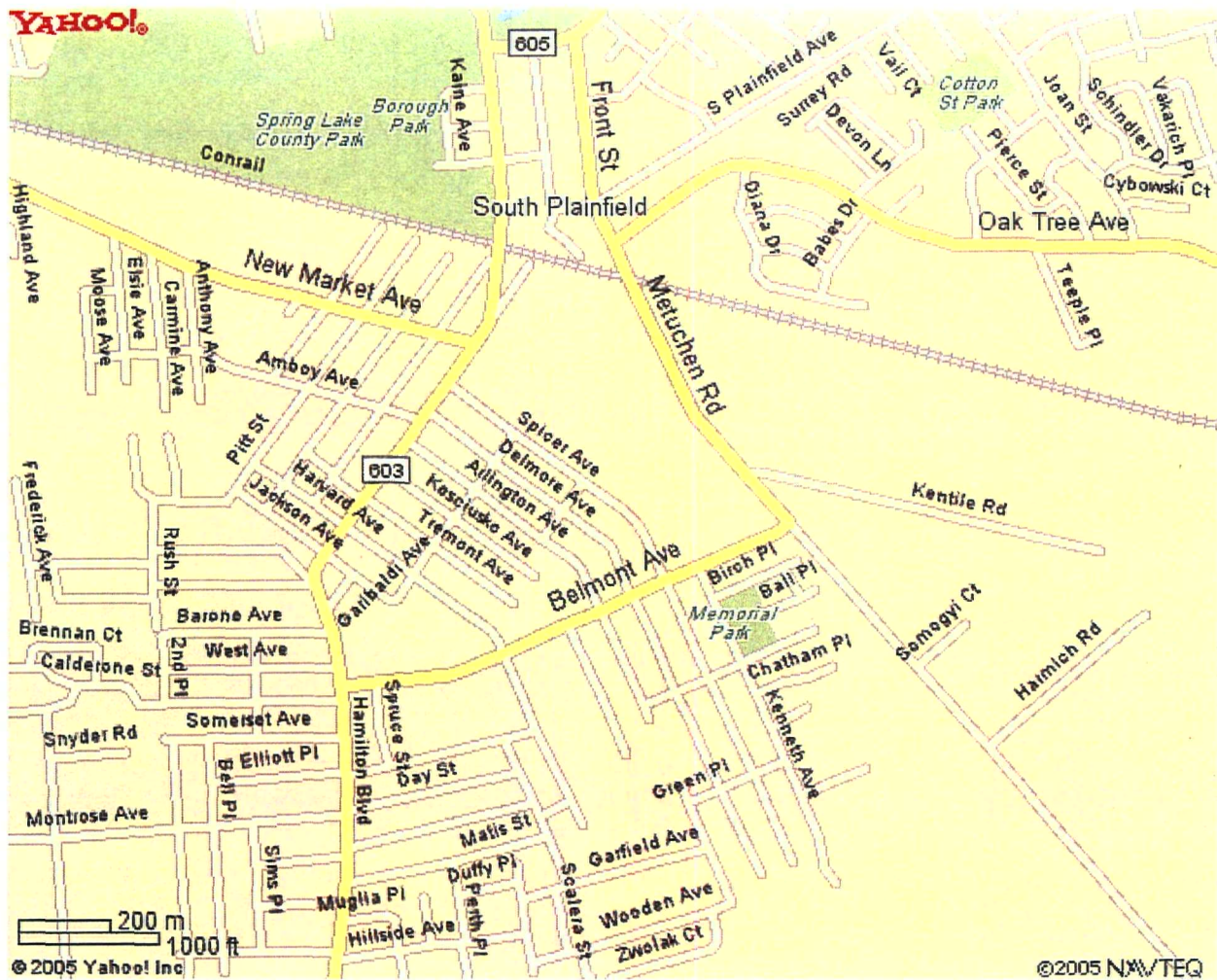
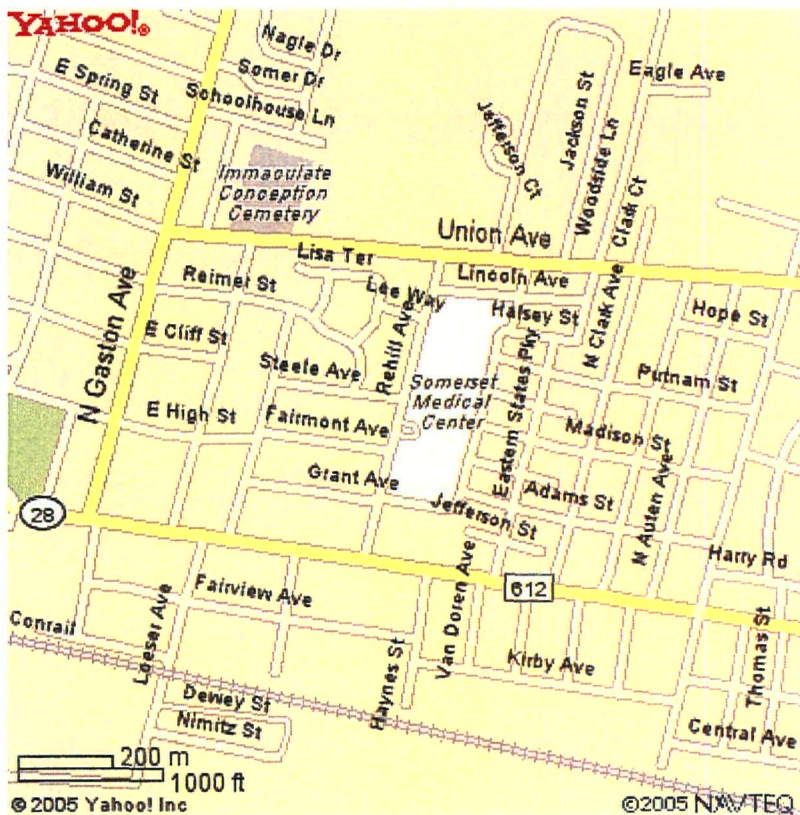
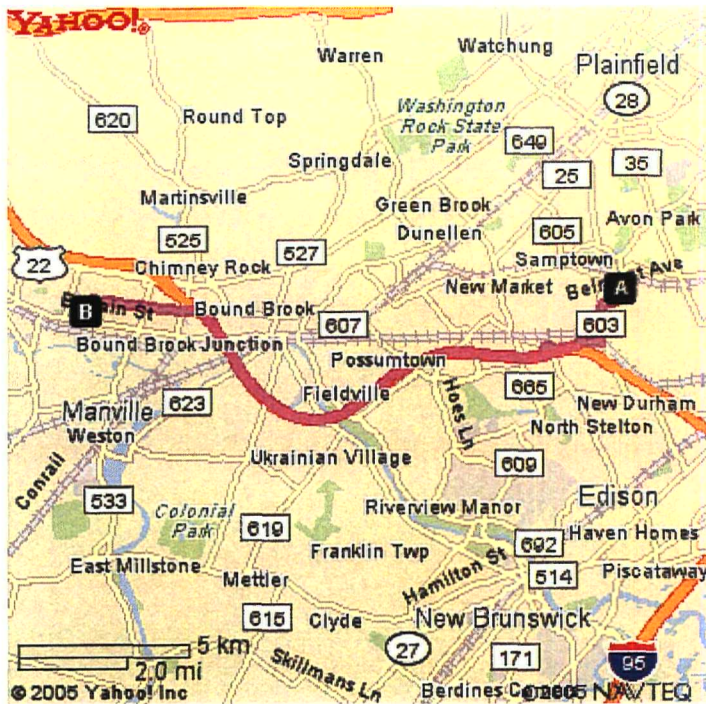
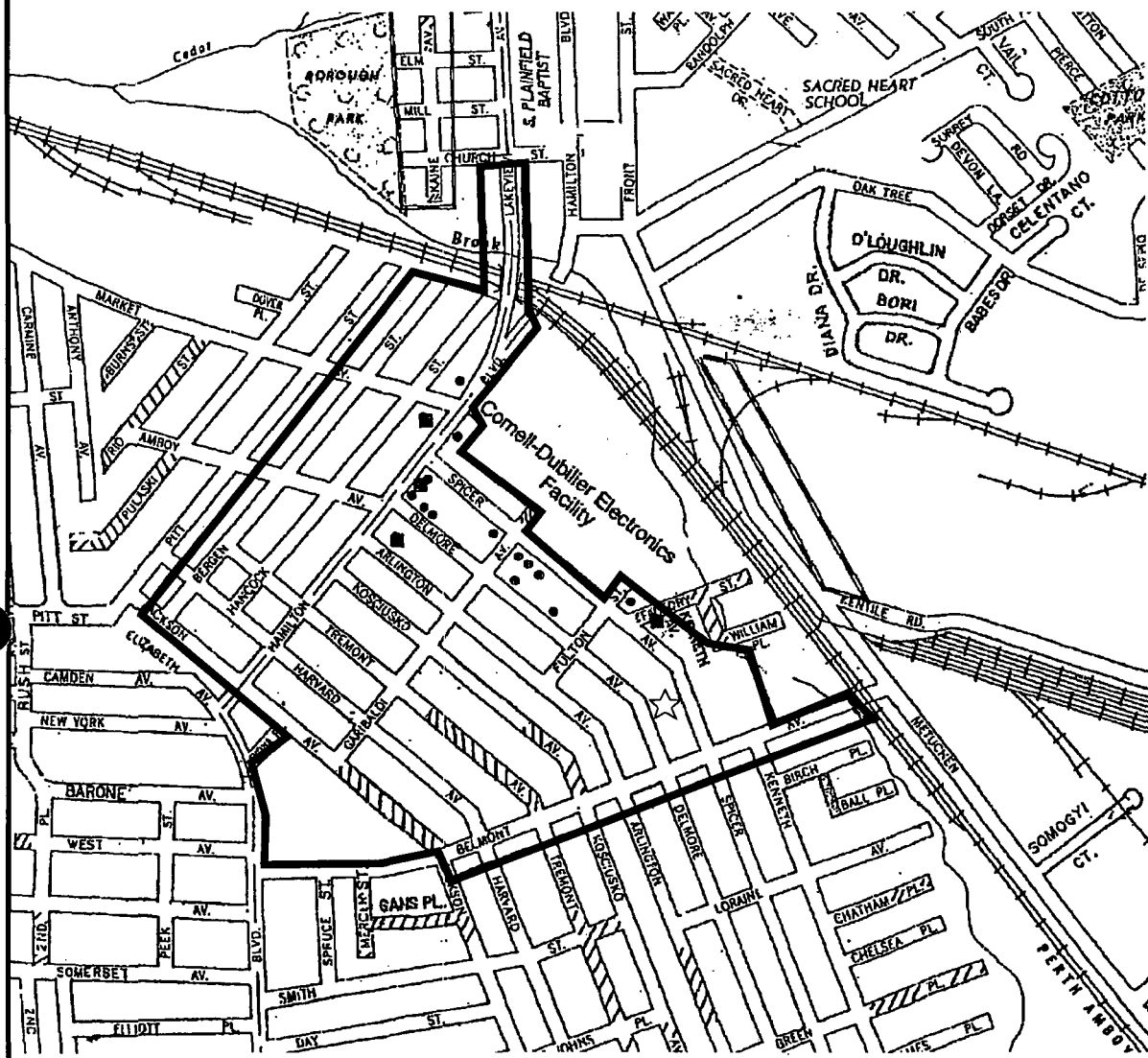


FIGURE 2

EMERGENCY HOSPITAL ROUTE MAP



Somerset Medical Center  
110 Rehill Avenue, Somerville, NJ 07080  
(908) 685-2200



**CORNELL-DUBILIER ELECTRONICS SITE**  
**OU-1 PROPERTIES**  
NOT TO SCALE

**LEGEND**

- PROPERTIES SELECTED FOR REMEDIAL ACTION
- PREVIOUSLY REMEDIATED PROPERTIES
- ☆ LOCATION OF FIELD TRAILERS AND LAYDOWN AREA

**CAPE**

180 Gordon Drive  
Suite 102  
Erlton, PA 19341  
(610) 594-8608

**REVISIONS:**

No.	Date	Remarks



**U. S. Army Corps  
of Engineers**  
KANSAS CITY DISTRICT

PROJECT NAME

OU-1 REMEDIAL DESIGN  
CORNELL-DUBILIER ELECTRONICS  
SUPERFUND SITE  
SOUTH PLAINFIELD, NEW JERSEY

SHEET TITLE

CORNELL-DUBILIER ELECTRONICS SITE  
OU-1 PROPERTIES

CONTRACT NO:  
W912DQ-05-D-0001

JOB NO:  
50001.001.001.002

CHECKED BY: W.TORRES  
DRAWN BY: B.DAVIS

DATE: JULY 05  
FILE NAME: CDEF03.HAS

FIGURE:

**FIGURE 3**

**ATTACHMENT 1**

**EMERGENCY CONTACT LIST**  
**AND**  
**EMERGENCY HOSPITAL ROUTE**

**Attachment 1**

**EMERGENCY CONTACT LIST <sup>1</sup>**

Ambulance/Paramedics – Emergency	9-1-1
Fire Department – Emergency	9-1-1
Police – Emergency	9-1-1
<u>Emergency Hospital</u> : Somerset Medical Center 110 Rehill Avenue, Somerville, NJ	(908) 685-2200
National Response Center	(800) 424-8802
CHEMTREC (Chemical Transportation Emergency Center)	(800) 424-9300
<u>USACE Contracting Officer</u> : Ralph Nunn Kansas City District, COE, 700 Federal Bldg., Kansas City, MO 64106	Office: (816) 983-3837 FAX: (816) 426-5777
<u>USACE Contracting Officer's Representative</u> : Patrick Nejand 214 State Highway 18 East Brunswick, NJ 08816	Office: (732) 846-5830 (main office) FAX: (732) 846-5837 Cell: (732) 501-2729
<u>EPA Point of Contact</u> : (Pietro Mannino) 290 Broadway Ave., New York, NY 10007	Office: (212) 637-4395 Cell: (631) 258-3725
<u>CAPE Project Office</u> : Exton, PA 180 Gordon Drive, Suite 102, Exton, PA 19341	Office: (610) 594-8606 FAX: (610) 594-8609
<u>CAPE Corporate Office</u> : Atlanta, GA 2302 Parklake Drive, Suite 200, Atlanta, GA 30345	Office: (770) 908-7200 FAX: (770) 908-7219
<u>CAPE Project Office</u> : 408 Spicer Avenue, South Plainfield, NJ 07080 (across the street)	Office: (908) 754-8848 FAX: (908) 754-8840
<u>USACE Project Office</u> : 408 Spicer Avenue, South Plainfield, NJ 07080 (across the street)	Office: (908) 754-4888 FAX: (908) 754-4885
<u>CAPE Project Manager</u> : Michael Lamon	Office: (865) 934-1331 FAX: (865) 934-1338 Cell: (865) 765-3643
<u>CAPE Project Superintendent</u> : Jerry Hackworth	Cell: (210) 872-7309
<u>CAPE Site Safety and Health Officer</u> : Ken Beatty, CHST	Office: (770) 908-7200 Cell: (678) 480-5622
<u>CAPE Safety and Health Manager and CHSM</u> : Glen Mayekawa, CIH	Office: (949) 474-3090 Cell: (714) 920-7483
<u>CAPE COCSM</u> : Charles Reed	Cell: (610) 745-3400
<u>CAPE Project Engineer</u> : Will Torres, PE	Cell: (717) 278-9428
<u>CAPE Project Administrator</u> : Greg Birch	Cell: (302) 373-5724
<u>CAPE Corporate Risk Manager</u> : Chris Caviness, PE, JD	Office: (770) 908-7200 FAX: (770) 908-7219
<u>CAPE Corporate Human Resources Supervisor</u> : Kathy Smothers	Office: (770) 908-7200 FAX: (770) 908-7219

**Note 1:** Cellular phone numbers shall be used for off-duty or emergency response calls.

**EVACUATION ASSEMBLY INFORMATION**

Evacuation Alarm	CAPE vehicle horn or air horn (single long sound)
Onsite Assembly Area	Beside CAPE vehicle.
Off Site Assembly Area	To Be Determined (TBD):

**Attachment 1**

**APPENDIX A**

**EMERGENCY HOSPITAL**

Somerset Medical Center  
110 Rehill Avenue, Somerville, NJ 07080  
(908) 685-2200

**EMERGENCY HOSPITAL AND ROUTE INFORMATION**

**Directions to Emergency Hospital:** From 408 and 507 Hamilton Blvd, South Plainfield, New Jersey 07080

Start out going SOUTH on CR-603 / Hamilton Blvd toward Delmore Ave (1.1 miles);  
Turn RIGHT to stay on CR-603 / Hamilton Blvd (1.1 miles);  
Turn LEFT onto CR-529 / Stelton Road (<0.1 miles);  
Merge onto I-287 N via the ramp on the LEFT (7.8 miles);  
Take the RT-28 W exit (Exit 13B) toward Somerville (0.2 miles);  
Stay STRAIGHT to go onto Union Avenue / NJ-28 (2.0 miles)  
Turn LEFT onto Rehill Ave (0.2 miles);  
Somerset Medical Center is at 110 Rehill Avenue.

Total Estimated Time: 20 minutes; Total Estimated Distance: 12.75 miles

**Directions to Emergency Hospital:** From 109 Arlington Avenue, South Plainfield, New Jersey 07080

Start out going NORTHWEST on Arlington Ave toward CR-603 / Hamilton Blvd. (<0.1 miles);  
Turn LEFT onto CR-603 / Hamilton Blvd (1.0 miles);  
Turn RIGHT to stay on CR-603 / Hamilton Blvd (1.1 miles);  
Turn LEFT onto CR-529 / Stelton Road (<0.1 miles);  
Merge onto I-287 N via the ramp on the LEFT (7.8 miles);  
Take the RT-28 W exit (Exit 13B) toward Somerville (0.2 miles);  
Stay STRAIGHT to go onto Union Avenue / NJ-28 (2.0 miles)  
Turn LEFT onto Rehill Ave (0.2 miles);  
Somerset Medical Center is at 110 Rehill Avenue.

Total Estimated Time: 20 minutes; Total Estimated Distance: 12.68 miles

**Directions to Emergency Hospital:** From 321 Spicer Avenue, South Plainfield, New Jersey 07080

Start out going SOUTHEAST on Spicer Ave toward Belmont Ave (0.1 miles);  
Turn RIGHT onto Belmont Ave (0.4 miles);  
Turn LEFT onto CR-603 / Hamilton Blvd. (0.7 miles);  
Turn RIGHT to stay on CR-603 / Hamilton Blvd (1.1 miles);  
Turn LEFT onto CR-529 / Stelton Road (<0.1 miles);  
Merge onto I-287 N via the ramp on the LEFT (7.8 miles);  
Take the RT-28 W exit (Exit 13B) toward Somerville (0.2 miles);  
Stay STRAIGHT to go onto Union Avenue / NJ-28 (2.0 miles)  
Turn LEFT onto Rehill Ave (0.2 miles);  
Somerset Medical Center is at 110 Rehill Avenue.

Total Estimated Time: 20 minutes; Total Estimated Distance: 12.90 miles

**SEE HOSPITAL ROUTE MAP (FIGURE 2)**

**ATTACHMENT 2**

**SSHP FORMS**

<b>ACCIDENT PREVENTION PLAN REVIEW</b>			
Contract Name and Number:	Contractor/Subcontractor:		
Government Inspector:	Location:		
Contractor Inspector:	Date:		
Listed below are the minimum basic requirements for and Accident Prevention Plan, taken from Appendix A, EM 385-1-1	Yes	No	N/A
<p>An Accident Prevention Plan is, in essence, a safety and health policy program document. The following areas are typically addressed in an accident prevention plan, but a plan shall be job-specific and shall also address any unusual or unique aspects of the project or activity for which it is written. The accident prevention plan shall interface with the employer's overall safety and health program. Any portions of the overall safety and health program that are referenced in the accident prevention plan shall be included as appropriate.</p>			
1. Signature Sheet. Title, signature, and phone numbers of the following: a. plan preparer (corporate safety staff person, QC) b. plan approval, e.g., owner, company president, regional vice president (HTRW activities require approval of a Certified Industrial Hygienist (or qualified Industrial Hygiene personnel for in-house USACE activities; a Certified Safety Professional (or qualified USACE safety personnel for in-House work) may approve the plan for operations involving UST removal Where contaminants are known to be petroleum, oils, or lubricants.) c. plan concurrence (provide concurrence of other applicable corporate and project personnel (contractor)), e.g., Chief of Operations, Corporate Chief of Safety, Corporate Industrial Hygienist, project manager or superintendent, Project safety professional, project QC.			
2. Background Information. List the following: a. contractor; b. contract number; c. project name; d. brief project description, description of work to be performed, and location (map); e. contractor accident experience (provide information such as EMR, OSHA 200 Forms, corporate safety trend analyses); f. listing of phases of work and hazardous activities requiring Activity Hazard Analyses (AHA).			
3. Statement of Safety and Health Policy. (In addition to the corporate policy statement, a copy of the corporate safety program may provide a significant portion of the information required by the accident prevention plan.)			
4. Responsibilities and Lines of Authorities: a. Identification and accountability of personnel responsible for safety – at both corporate and project level (contracts specifically requiring safety or industrial hygiene personnel should include a copy of their resume – the District Safety and Occupational Health Office will review the qualifications for acceptance). b. Lines of Authority			

This checklist is based on EM 385-1-1, dated 3 September 1996. Use of this checklist is optional.

ACCIDENT PREVENTION PLAN REVIEW (con.)		Yes	No	N/A
5. Subcontractors and Suppliers. Provide the following:				
a. identification of subcontractors and suppliers (if known)				
b. means for controlling and coordinating subcontractors and suppliers;				
c. safety responsibilities of subcontractors and suppliers.				
6. Training:				
a. List subjects to be discussed with employees in safety indoctrination.				
b. List mandatory training and certifications which are applicable to this project (e.g., explosive actuated tools, confined space entry, crane operator, diver, vehicle operator, HAZWOPER training and certification, personal protective equipment) and any requirements for periodic retraining/re-certification.				
c. Outline Requirements.				
7. Safety and Health Inspections. Provide details on:				
a. who will conduct safety inspections (e.g., project manager, safety professional, QC, supervisors, employees, etc.), when inspections will be conducted, how the inspections will be recorded, deficiency tracking system, follow-up procedures, etc;				
b. any external inspections/certifications which may be required (e.g., Coast Guard)				
8. Safety and Health Expectations, Incentive Programs, and Compliance:				
a. The company's written safety program goals, objectives, and accident experience goals for this contract should be provided.				
b. A brief description of the company's safety incentive programs (if any) should be provided.				
c. Policies and procedures regarding noncompliance with safety requirements (to include disciplinary actions for violation of safety requirements) should be identified.				
d. Provide written company procedures for holding managers and supervisors accountable for safety.				
9. Accident Reporting. The contractor shall identify who shall complete the following, how, and when:				
a. exposure data (man-hours worked);				
b. accident investigations, reports and logs;				
c. immediate notification of major accidents.				
10. Medical Support. Outline on-site medical support and off-site medical arrangements.				
11: Personal Protective Equipment. Outline procedures (who, when, how) for conducting hazard assessments and written certifications for use of personal protective equipment.				
12. Plans (Programs, Procedures) Required by the Safety Manual (as applicable).				
a. hazard communication program (01.B.04);				
b. emergency response plans:				
- procedures and tests (01.E.01)				
- spill plans (01.E.01, 06.A.02)				

This checklist is based on EM 385-1-1, dated 3 September 1996. Use of this checklist is optional.

ACCIDENT PREVENTION PLAN REVIEW (con.)	Yes	No	N/A
- firefighting plan (01.E.01, 19.A.04)			
- posting of emergency telephone numbers (01.E.04)			
- wildfire prevention plan (09.K.01)			
- man overboard/abandon ship (19.A.04)			
c. layout plans (04.A.01);			
d. respiratory protection plan (05.E.01);			
e. health hazard control program (06.A.02);			
f. lead abatement plan (06.B.05 & specifications);			
g. asbestos abatement plan (06.B.05 & specifications);			
h. abrasive blasting (06.H.01);			
i. confined space (06.I);			
j. hazardous energy control plan (12.A.07);			
k. critical lift plan (16.C.17);			
l. contingency plan for severe weather (19.A.03);			
m. access and haul road plan (22.I.10);			
n. demolition plan (engineering and asbestos surveys) (23.A.01);			
o. emergency rescue (tunneling) (26.A.05);			
p. underground construction fire prevention and protection plan (26.D.01);			
q. compressed air plan (26.I.01);			
r. formwork and shoring erection and removal plans (27.B.02);			
s. lift slab plans (27.B.02);			
t. SHP and SSHP (for HTRW work and SSHP must be submitted and shall contain all information required by the accident prevention plan - two documents are not required (28.B.01)			
u. blasting plan (29.A.01);			
v. diving plan (30.A.13);			
w. plan for prevention of alcohol and drug abuse (Defense Federal Acquisition Regulation Supplement Subpart 252.223.7004, Drug-Free Work Force);			
<p>13. The contractor shall provide information on how they will meet the requirements of major sections of EM 385-1-1 in the accident prevention plan. Particular attention shall be paid to excavations, scaffolding, medical and first aid requirements, sanitation, personal protective equipment, fire prevention, machinery and mechanized equipment, electrical safety, public safety requirements, and chemical, physical agent, and biological occupational exposure prevention requirements. Detailed site specific hazards and controls shall be provided in the activity hazard analysis for each phase of operation.</p>			
<p>Comments:</p>			

This checklist is based on EM 385-1-1, dated 3 September 1996. Use of this checklist is optional.

## CAPE ENVIRONMENTAL

### ACTIVITY HAZARD ANALYSIS PREPARATORY PHASE TRAINING LOG

Activity Hazard Analysis Phase Number: \_\_\_\_\_

Site: \_\_\_\_\_

Location: \_\_\_\_\_

The following individuals have reviewed and have agreed to follow the Activity Hazard Analysis prepared by the Cape Environmental Management Inc (CAPE) for the above indicated site and understand the hazards and control measures required on this phase of the project.

I agree to follow the procedures outlined in this plan and to inform the CAPE Project Manager, Superintendent, and/or Site Safety and Health Officer should any unsafe condition be noted.

I understand that failure to follow safety regulations can be reason for removal from this project.

Date	Name	Signature	Company

## AIR MONITORING LOG

Project Name: \_\_\_\_\_  
Project Location: \_\_\_\_\_  
Page Number: \_\_\_\_\_  
Date: \_\_\_\_\_  
Conducted By: \_\_\_\_\_

[illegible]

PID:	Photoionization detector
FID:	Flame ionization detector
LEL:	Lower explosive limit
O <sub>2</sub> :	Oxygen meter
mg/m <sup>3</sup> :	Milligrams per cubic meter
ppm:	Parts per million

## CAPE ENVIRONMENTAL

### CALIBRATION LOG: DIRECT-READING MONITORING INSTRUMENT

Project Name: \_\_\_\_\_

Project Location: \_\_\_\_\_

Date:	Calibration Gas:
Name:	Concentration:
Initial Reading:	Comments:
Adjusted Reading:	
Date:	Calibration Gas:
Name:	Concentration:
Initial Reading:	Comments:
Adjusted Reading:	
Date:	Calibration Gas:
Name:	Concentration:
Initial Reading:	Comments:
Adjusted Reading:	
Date:	Calibration Gas:
Name:	Concentration:
Initial Reading:	Comments:
Adjusted Reading:	
Date:	Calibration Gas:
Name:	Concentration:
Initial Reading:	Comments:
Adjusted Reading:	

CAPE ENVIRONMENTAL

CERTIFICATE OF WORKER AND VISITOR ACKNOWLEDGMENT

Name: \_\_\_\_\_  
Organization: \_\_\_\_\_  
Project Name: \_\_\_\_\_  
Project Location: \_\_\_\_\_

The contract for the above indicated project requires the following: That you be provided with formal and site-specific training on the applicable aspects of the Site Safety and Health Plan (SSHP); that you be supplied with proper personal protective equipment (PPE) including respirators and that you be trained in its use; that you receive a medical examination to evaluate your physical capacity to perform your assigned work tasks, under the environmental conditions expected, while wearing the required PPE. These are to be done at no cost to you. By signing this certification, you are acknowledging that your employer has met these obligations to you.

**I HAVE REVIEWED, UNDERSTAND AND AGREE TO FOLLOW THE SSHP FOR THIS SITE.**

\_\_\_\_\_  
Signature / Date

**FORMAL TRAINING:** I have completed the following formal hazardous waste operations (HazWOPER) training courses that meet OSHA requirements:

\_\_\_\_ 40-Hour HazWOPER Worker (date completed): \_\_\_\_\_  
\_\_\_\_ 8-Hour HazWOPER Supervisor (date completed): \_\_\_\_\_  
\_\_\_\_ 8-Hour HazWOPER Refresher (date completed): \_\_\_\_\_

**SITE-SPECIFIC TRAINING:** I have been provided and have completed the site-specific training required by this Contract. Name of the Site Safety and Health Officer (SSHO) who conducted the training: \_\_\_\_\_

**RESPIRATORY PROTECTION AND RESPIRATOR FIT-TEST TRAINING:** I have been trained in accordance with the criteria in the [Contractors] [Employers] respiratory protection program. I have been trained in proper work procedures, use and limitations of the respirator(s) that I will wear. I have been trained in and will abide by the facial hair policy. I have been trained in the proper selection, fit, use, care, cleaning, maintenance, and storage of respirator(s) that I will wear. I have been fit-tested in accordance with criteria in the [Contractors] ([Employers] respirator program and have received a satisfactory fit. [I have been assigned my individual respirator.] I have been taught how to properly perform a positive and negative pressure user seal check upon donning a negative pressure respirator each time: Initial: \_\_\_\_\_

**MEDICAL EXAMINATION:** I have had a medical examination within the last twelve months that was paid for by my employer. The examination included a health history, pulmonary function test, and may have included an evaluation of a chest X-ray. A physician made determinations regarding my physical capacity to perform work tasks on the project while wearing PPE including a respirator. I was personally provided a copy and informed of the results of that examination. My employers industrial hygienist evaluated the medical certification provided by the physician and checked the following information.

Date of Medical Exam: \_\_\_\_\_  
Physician Determined: \_\_\_\_\_ No limitations to performing the required work tasks  
\_\_\_\_\_ Physical limitations to performing required work tasks identified

[Employee] [Visitor] Printed Name / Signature / Date: \_\_\_\_\_  
Contractor SSHO Printed Name / Signature / Date: \_\_\_\_\_

**CAPE ENVIRONMENTAL**

**EMERGENCY MEDICAL NOTIFICATION FORM**

**Employee Name:** \_\_\_\_\_

**Mailing Address:** \_\_\_\_\_

**Home Telephone:** \_\_\_\_\_

**EMERGENCY NOTIFICATION INFORMATION**

*In Case of Emergency Notify:*

**Name / Relationship / Telephone:** \_\_\_\_\_

**Name / Relationship / Telephone:** \_\_\_\_\_

**ALLERGIES**

**List any health-threatening allergies (i.e., medications, food, bee stings):**

\_\_\_\_\_  
\_\_\_\_\_

**MEDICATIONS**

**List current medications that may affect the ability to safely operate equipment/machinery:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**OTHER INFORMATION**

**List any other information that should be known in case of an emergency:**

\_\_\_\_\_  
\_\_\_\_\_

**Name (print):** \_\_\_\_\_

**Signature / Date:** \_\_\_\_\_

## CAPE ENVIRONMENTAL

### EQUIPMENT DECONTAMINATION RELEASE AUTHORIZATION

Date / Day:

Project Name:

Project Location:

Equipment Type:

Equipment Mfr / Model:

Equipment Number:

Item	Inspection Description	Clean	Not Clean	N/A
1	Tires / Rims, outside			
2	Tires / Rims, inside			
3	Buckets / Blades			
4	Rippers / Other			
5	Cross-members			
6	Undercarriage			
7	Tracks			
8	Drive carriage			
9	Drip pans			
10	Brush guards			
11	Belly pans			
12	Scraper can interior			
13	Truck beds			
14	Frames			
15	Engine compartment			
16	Cab			

Equipment Use:

Decontamination Description:

I certify that I have inspected the equipment indicated above and have observed that visible material has been removed from the equipment.

Inspected By / Signature / Date

## CAPE ENVIRONMENTAL

### EXCAVATION SAFETY CHECKLIST (To be Completed by the Competent Person)

Date: \_\_\_\_\_  
Project Name: \_\_\_\_\_  
Project Location: \_\_\_\_\_  
Competent Person: \_\_\_\_\_  
Excavation Description: \_\_\_\_\_  
Excavation Depth / Width: \_\_\_\_\_  
U.S.A Permit # and Date: \_\_\_\_\_  
OSHA Permit # and Date: \_\_\_\_\_

#### EXCAVATION INFORMATION

	<u>Circle</u>	<u>Describe</u>
Hazardous Atmosphere:	Yes / No	_____
Access / Egress:	Yes / No	_____
Traffic Control:	Yes / No	_____
Wet Conditions:	Yes / No	_____

Utilities:	<u>Circle</u>	<u>Company / Date</u>
Electrical:	Yes / No	_____
Gas:	Yes / No	_____
Telephone:	Yes / No	_____
Water:	Yes / No	_____
Sewer:	Yes / No	_____

Protective System Used:	<u>Circle</u>	<u>Describe</u>
Sloping:	Yes / No	_____
Benching:	Yes / No	_____
Shoring:	Yes / No	_____
Shielding:	Yes / No	_____

**CAPE ENVIRONMENTAL  
EXCAVATION SAFETY CHECKLIST (Continued)  
Visual Soil Classification Test**

**Date / Time:** \_\_\_\_\_  
**Competent Person:** \_\_\_\_\_  
**Soil Sample Location:** \_\_\_\_\_

The Competent Person is required to make daily inspections of excavations, adjacent areas, and excavation protective systems. This checklist is completed by the Competent Person to document visual soil classification tests used to determine soil type(s) present in an excavation. A separate analysis is performed on each layer of soil in the excavation walls or if the excavation stretches over a distance where the soil type may change.

	<u><b>Circle</b></u>	<u><b>Describe</b></u>
<b>Particle Type:</b>		
Fine grained soil (cohesive):	Yes / No	_____
Coarse grained soil (sand/gravel):	Yes / No	_____
<b>Water Conditions:</b>		
Dry:	Yes / No	_____
Wet/Surface Water/Submerged:	Yes / No	_____
<b>Surface Encumbrances:</b>	Yes / No	_____
<b>Previously Disturbed Soil:</b>	Yes / No	_____
<b>Layered Soils / Dip into Excavation:</b>	Yes / No	_____
<b>Exposure to Vibrations:</b>	Yes / No	_____
<b>Fissures / Cracking / Spalling:</b>	Yes / No	_____
<b>Hazardous Atmosphere:</b>	Yes / No	_____
<b>Confined Space Exposure:</b>	Yes / No	_____
<b>Vehicle Traffic Present:</b>	Yes / No	_____

**CAPE ENVIRONMENTAL**  
**EXCAVATION SAFETY CHECKLIST (Continued)**  
**Manual Soil Classification Test**

**Date / Time:** \_\_\_\_\_  
**Competent Person:** \_\_\_\_\_  
**Soil Sample Location:** \_\_\_\_\_

The Competent Person is required to make daily inspections of excavations, adjacent areas, and excavation protective systems. This checklist is completed by the Competent Person to document manual soil classification tests used to determine soil type(s) present in an excavation. A separate analysis is performed on each layer of soil in the excavation walls or if the excavation stretches over a distance where the soil type may change. Unconfined compressive strength tests are performed on undisturbed soils. No soil is Type A if the soil is fissured; subject to vibration; previously disturbed; or layered dipping into excavation on a slope of 4H:1V.

	<b>Circle</b>	<b>Describe</b>
<b>Plasticity Test:</b>		
Cohesive:	Yes / No	_____
Non-Cohesive:	Yes / No	_____
<b>Dry Strength Test:</b>		
Granular (crumbles easily):	Yes / No	_____
Cohesive (broken with difficulty):	Yes / No	_____
<b>Thumb Penetration Test:</b>		
Type A Soil (soil indented by thumb with very great effort)	Yes / No	_____
Type B Soil (soil indented by thumb with some effort)	Yes / No	_____
Type C Soil (soil easily indented by thumb with little or no effort)	Yes / No	_____
<b>Pocket Penetrometer Test:</b>		
Type A Soil ( $\geq 1.5$ tsf)	Yes / No	_____
Type B Soil (0.5 - 1.5 tsf)	Yes / No	_____
Type C Soil ( $< 0.5$ tsf)	Yes / No	_____

---

**Soil Classification (Circle):**      Type A / Type B / Type C  
**Excavation Protective System:** \_\_\_\_\_  
**Competent Person:** \_\_\_\_\_  
**Signature:** \_\_\_\_\_  
**Date:** \_\_\_\_\_

## CAPE ENVIRONMENTAL

### HEAVY EQUIPMENT INSPECTION REPORT

Date / Day: \_\_\_\_\_

Project Name: \_\_\_\_\_

Project Location: \_\_\_\_\_

Equipment Type: \_\_\_\_\_

Equipment Mfr / Model: \_\_\_\_\_

Equipment Number: \_\_\_\_\_

Item	Inspection Description	Good	Need Repair	N/A
1	Tires or tracks			
2	Hydraulic oil and hose condition			
3	Oil leak / lube leak			
4	Cab; mirrors; seat belt; glass			
5	Horn; gauges			
6	Lights			
7	Turn signals			
8	Backup lights and alarm			
9	Brake condition (dynamic, park, etc.)			
10	Fire extinguisher condition			
11	Engine oil			
12	Transmission fluid			
13	Windshield wipers			
14	Coupling devices and connectors			
15	Exhaust system			
16	Blade / Boom / Ripper condition			
17	Frame, ladders, and walkway			
18	Power cable and/or hoist cable			
19	Steering (standard and emergency)			

Defects and Repairs Needed:

General Safety Condition:

Inspected By:

Signature:

**CAPE ENVIRONMENTAL**  
**HAZARDOUS SUBSTANCE INVENTORY LIST**

<b>MSDS on File</b>	<b>Product Name</b>	<b>Manufacturer</b>	<b>Location and Container Type</b>



## POST AT JOB SITE

### Incident Reporting and Investigation Procedures Posting (Injury/Property Damage/Liability Exposure/Spills/Fires/Serious Near Miss Incidents)

Notify the Site Supervisor or Site Safety and Health Officer (SSHO) immediately of injuries, property damage, liability exposure, spills, fires, and serious near miss incidents. The Site Supervisor or his/her representative shall:

- Take care of injured personnel immediately
- Secure remaining dangerous conditions to prevent accidents and additional damage
- Secure the incident scene to preserve information
- Identify employees involved in the incident and witnesses and obtain initial information
- Notify the Project Manager (PjM), Corporate Health and Safety Manager (CHSM), and Corporate Risk Manager (RM) about the incident and receive further instructions. **Notify as soon as possible and no later than 2 hours of the incident**
- Initiate fact finding. Investigate the site, interview witnesses, and document circumstances and facts. Complete preliminary documentation forms. Depending upon incident severity and complexity, fact finding may involve other investigators determined by the CHSM
- Complete required CAPE forms: Incident Statement by Employee, Incident Statement by Witness, Incident Report by Supervisor, Injury and Illness Report, Vehicle Accident Report, and/or Property Damage, Loss and General Liability Report. Submit all forms (if a form is not applicable write N/A on the form.)
- **Submit completed forms to the CHSM, RM and PjM within 24 hours of an incident and immediately forward additional information as it becomes available.**

**NOTE:** Accidents resulting in a fatality or multiple hospitalizations require reporting to the nearest OSHA office within 8 hours (1-800-321-OSHA). This report shall be made by the CHSM. A written report shall follow that provides OSHA with all details of the accident required by 29 CFR 1904.8. Any equipment, material, or related evidence that might help in an investigation must not be moved except to prevent further accidents. The CHSM will record injuries on the OSHA 300 log.

#### INCIDENT REPORTING CONTACT INFORMATION:

PjM: \_\_\_\_\_ - Office \_\_\_\_\_ - Fax \_\_\_\_\_ - Cell \_\_\_\_\_

CHSM: Glen Mayekawa - Office (949) 474-3090 - Fax (949) 474-3091 - Cell (714) 920-7483

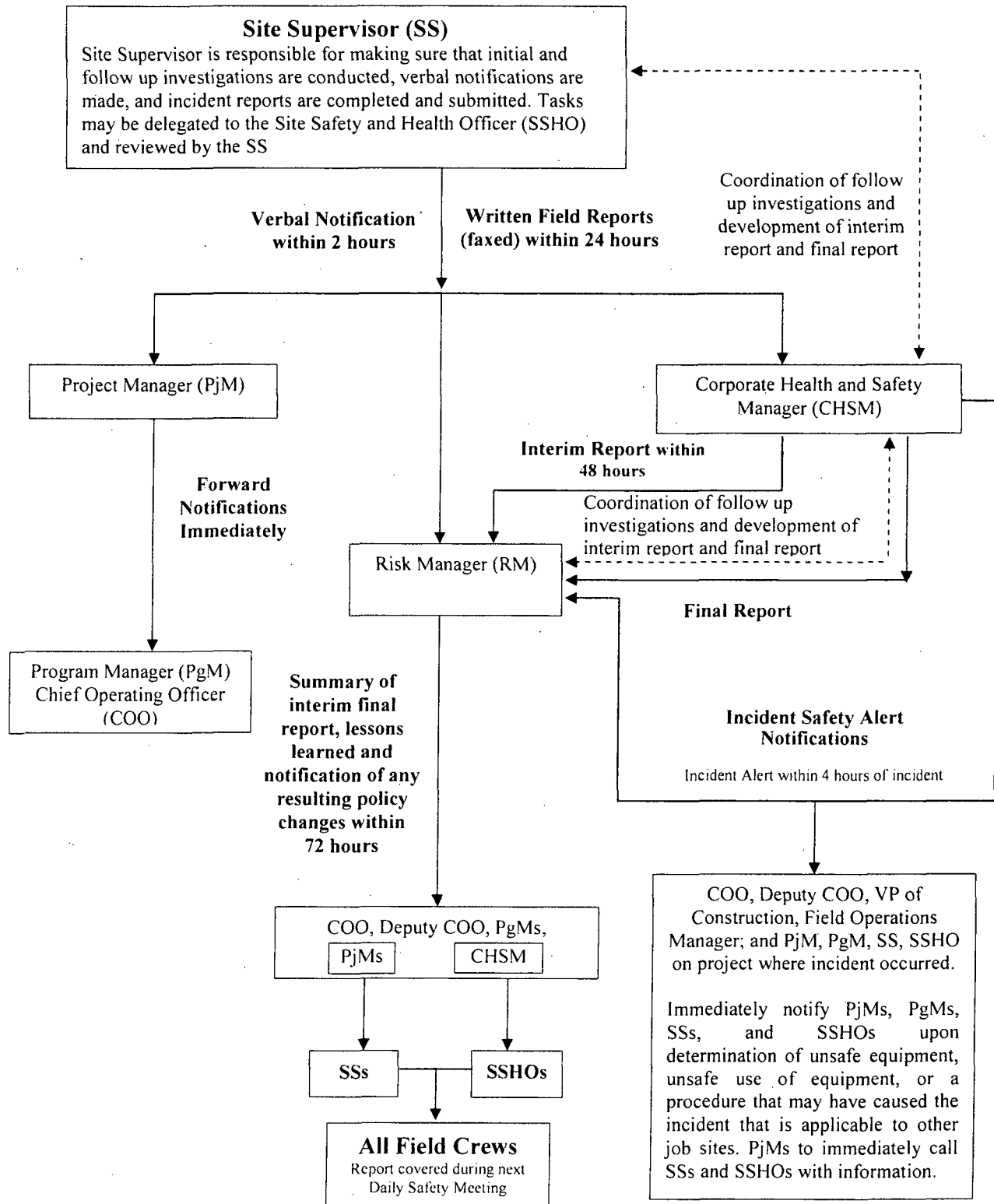
RM: Chris Caviness - Office (770) 908-7200 - Fax (770) 908-7219

**FAILURE OF A CAPE EMPLOYEE TO PROMPTLY REPORT A SAFETY INCIDENT OR FAILURE TO PRESERVE AN ACCIDENT SCENE UNTIL AN INVESTIGATION IS COMPLETED, IS GROUNDS FOR DISCIPLINARY ACTION.**

## POST AT JOB SITE

### Incident Reporting and Investigation Protocol Flow Chart Posting

(Includes: injuries, property damage, liability exposure, spills, fires, and serious near miss incidents)



## CAPE ENVIRONMENTAL INCIDENT REPORT BY SUPERVISOR

Date of Incident:
Time of Incident:
Project Name:
Project Number:
Client Name:
Client Location:
Specific Location of Incident:
Employees Involved in Incident (if applicable):
Detailed Description of Incident:
Primary Cause of Incident:
Contributing Cause(s) of Incident:
Recommendation for Preventing Such Incidents in the Future:
Supervisor Name (print):
Signature:
Date:

**CAPE ENVIRONMENTAL  
INCIDENT STATEMENT BY EMPLOYEE**

<b>Employee Name:</b>
<b>Date of Incident:</b>
<b>Time of Incident:</b>
<b>Project Name:</b>
<b>Project Number:</b>
<b>Client Name:</b>
<b>Client Location:</b>
<b>Specific Location of Incident:</b>
<b>Describe What You Were Doing Just Before the Incident:</b>
<b>Detailed Description of How the Incident Occurred:</b>
<b>Names of Witnesses:</b>
<b>Other Relevant Information:</b>
<b>How Can the Likelihood of this Happening Again Be Reduced:</b>
<b>Employee Name (print):</b>
<b>Signature:</b>
<b>Date:</b>

**CAPE ENVIRONMENTAL  
INCIDENT STATEMENT BY WITNESS**

<b>Witness Name:</b>
<b>Address:</b>
<b>Telephone:</b>
<b>Employer:</b>
<b>Telephone:</b>
<b>Date of Incident:</b>
<b>Time of Incident:</b>
<b>Project Name:</b>
<b>Project Number:</b>
<b>Client:</b>
<b>Location:</b>
<b>Specific Location of Incident:</b>
<b>DETAILED DESCRIPTION OF INCIDENT BASED ON PERSONAL OBSERVATION</b>
<b>Describe where you were and what you were doing just before the incident:</b>
<b>Describe any injuries:</b>
<b>Describe any property damaged:</b>
<b>Describe what was the apparent nature of the injury and/or damage:</b>
<b>Describe what personnel and/or equipment were involved:</b>
<b>Describe what caused the injury and/or damage:</b>
<b>Describe the sequence of events:</b>
<b>List any observed unsafe acts or conditions:</b>
<b>Names of other witnesses:</b>
<b>Other relevant information:</b>
<b>Witness Name (print):</b>
<b>Signature:</b>
<b>Date:</b>

# CAPE ENVIRONMENTAL INJURY AND ILLNESS REPORT

Injured Employee Name:	Date / Time of Injury:
Social Security Number:	Date of Birth / Age:
Sex (M / F):	Date of Hire:
Job Title:	Pay Rate:
Home Address:	Home Telephone:
Cape Home Office:	Injured on Cape Premises: Yes / No
Client / Location:	Injured on Client Premises: Yes / No
Specific Accident Location:	
Nature of Injury:	
Exact Body Part Injured:	
Medical Attention (Circle): None First Aid Paramedics Doctor Hospital ER	
Medical Attention Description:	
Hospital / Doctor Name / Telephone:	
Hospital / Doctor Address:	
Date / Time Injury Reported:	
By Whom:	
Did employee leave work: (Yes / No)	
When:	
Has employee returned to work: (Yes / No)	
When:	
Note: Employee must present return to work release from examining physician before return to work)	
Did employee have a work activity restriction: (Yes / No)	
Dates restricted:	
Did employee miss a regularly scheduled work shift: (Yes / No)	
Dates missed:	
Injury Incident Description:	
What actions have been taken to prevent recurrence:	
Witness Name:	Telephone:
Address:	Statement Attached: Yes / No
INVESTIGATION AND REVIEW (Report to CHSM within 2 days of injury)	
Site Supervisor Name (print) / Signature / Date:	
Project Manager Name (print) / Signature / Date:	
CHSM Name (print) / Signature / Date:	
Attached to this report:   Incident Statement by Employee   Incident Report by Supervisor	
Incident Statement by Witness   Photographs   Maps/Sketches   Other	

# CAPE ENVIRONMENTAL PROPERTY DAMAGE, LOSS AND GENERAL LIABILITY REPORT

Project Name:
Project No.:
Project Location:
Project Manager / Supervisor:
Date / Time of Damage or Loss:
Description / Identification of damaged or lost property:
Location of damaged or lost property (before loss):
Detailed description of how the damage or loss occurred:
Cause and corrective action recommended to prevent recurrence:
Owner of damaged or lost property / Telephone:
Address:
Employer Name and Address:
Witnesses:
Witness Name / Telephone:
Address:
Employer Name and Address:
Witness Name / Telephone:
Address:
Employer Name and Address:
Repair or Replacement Cost:
Attachments: <input type="checkbox"/> Photographs <input type="checkbox"/> Police Report <input type="checkbox"/> Incident Statement by Witness <input type="checkbox"/> Incident Report by Supervisor <input type="checkbox"/> Incident Statement by Employee <input type="checkbox"/> Injury Report
Supervisor Name (print):
Signature:
Date:

**CAPE ENVIRONMENTAL**  
**SAFETY INSPECTION REPORT**

**Customer / Address:** \_\_\_\_\_  
**Date / Day / Time:** \_\_\_\_\_  
**Project Name:** \_\_\_\_\_  
**Project Location:** \_\_\_\_\_  
**Work Description:** \_\_\_\_\_  
**Comments / Other:** \_\_\_\_\_

**OBSERVATIONS**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Safety Conditions Requiring Corrective Action	Corrective Action, Assignment, and Completion Date

**Project Manager:** \_\_\_\_\_  
**Safety Inspector:** \_\_\_\_\_  
**Distribution:** \_\_\_\_\_

**CAPE ENVIRONMENTAL**

**SAFETY MEETING ATTENDANCE ROSTER**

**Project Name:** \_\_\_\_\_

**Project Location:** \_\_\_\_\_

**Topic:** \_\_\_\_\_

<b>Date</b>	<b>Name</b>	<b>Signature</b>	<b>Company</b>

\_\_\_\_\_  
**Instructor Name (Print)**

\_\_\_\_\_  
**Instructor Signature**

\_\_\_\_\_  
**Date**

## SITE CONTROL LOG

**Project Location:**

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[illegible]

## CAPE ENVIRONMENTAL

### SITE SAFETY AND HEALTH PLAN DISTRIBUTION TO SUBCONTRACTOR

A copy of the Site Safety and Health Plan for the site is being provided to subcontractors who may be affected by activities covered under the scope of this plan. Distribution of the Site Safety and Health Plan to subcontractor firms and their designated contact person is with the understanding that subcontractor personnel involved in this project will review this document, abide by its provisions, and comply with OSHA and other applicable health and safety rules and regulations for work onsite.

Date	Name	Signature	Organization

## CAPE ENVIRONMENTAL

### SITE SAFETY AND HEALTH PLAN REVIEW

I have reviewed the Cape Environmental Management Inc (CAPE) Site Safety and Health Plan for the above indicated site and understand the hazards and control measures required on this project.

I agree to follow the procedures outlined in this plan and to inform the CAPE Project Manager, Superintendent, and/or Site Safety and Health Officer should any unsafe condition be noted.

I understand that failure to follow safety regulations can be reason for removal from this project.

Date	Name	Signature	Company

**CAPE ENVIRONMENTAL**  
**TAILGATE SAFETY MEETING RECORD**

<b>Date / Day:</b>	<b>Time:</b>
<b>Project Name:</b>	<b>Project Number:</b>
<b>Client:</b>	<b>Address:</b>
<b>Specific Location:</b>	
<b>Work Description:</b>	
<b>Comments:</b>	
<b>SAFETY TOPICS PRESENTED</b>	
<b>Protective Clothing / Equipment:</b>	
<b>Chemical Hazards:</b>	
<b>Physical Hazards:</b>	
<b>Emergency Procedures:</b>	
<b>Emergency Hospital:</b>	
<b>Hospital Telephone:</b>	
<b>Hospital Directions:</b>	
<b>Special Equipment:</b>	
<b>Other:</b>	
<b>SAFETY MEETING ATTENDEES</b>	
<b>Name Printed / Initial</b>	<b>Name Printed / Initial</b>
1.	6.
2.	7.
3.	8.
4.	9.
5.	10.
<b>Meeting conducted by (print name / signature):</b>	

**CAPE ENVIRONMENTAL**  
**TRAINING ATTENDANCE ROSTER**

**Project Name:** \_\_\_\_\_

**Project Location:** \_\_\_\_\_

**Topic:** \_\_\_\_\_

<b>Date</b>	<b>Name</b>	<b>Signature</b>	<b>Company</b>

\_\_\_\_\_  
**Instructor Name (Print)**

\_\_\_\_\_  
**Instructor Signature**

\_\_\_\_\_  
**Date**

(For Safety Staff only)	REPORT NO.	EROC CODE	<b>UNITED STATES ARMY CORPS OF ENGINEERS</b> <b>ACCIDENT INVESTIGATION REPORT</b> <i>(For Use of this Form See Help Menu and USACE Suppl to AR 385-40)</i>		<b>REQUIREMENT CONTROL SYMBOL:</b> <b>CEEC-S-8(R2)</b>
<b>1. ACCIDENT CLASSIFICATION</b>					
PERSONNEL CLASSIFICATION		INJURY/ILLNESS/FATAL		PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED
GOVERNMENT <input type="checkbox"/> CIVILIAN <input type="checkbox"/> MILITARY		<input type="checkbox"/>		<input type="checkbox"/> FIRE INVOLVED <input type="checkbox"/> OTHER	<input type="checkbox"/>
<input type="checkbox"/> CONTRACTOR		<input type="checkbox"/>		<input type="checkbox"/> FIRE INVOLVED <input type="checkbox"/> OTHER	<input type="checkbox"/>
<input type="checkbox"/> PUBLIC		<input type="checkbox"/> FATAL <input type="checkbox"/> OTHER		<div style="border: 1px solid black; width: 100px; height: 100px; margin: 0 auto;"></div>	
<b>2. PERSONAL DATA</b>					
a. Name (Last, First, MI)		b. AGE	c. SEX <input type="checkbox"/> MALE <input type="checkbox"/> FEMALE	d. SOCIAL SECURITY NUMBER	
f. JOB SERIES/TITLE		g. DUTY STATUS AT TIME OF ACCIDENT  <input type="checkbox"/> ON DUTY <input type="checkbox"/> TDY  <input type="checkbox"/> OFF DUTY		h. EMPLOYMENT STATUS AT TIME OF ACCIDENT <input type="checkbox"/> ARMY ACTIVE <input type="checkbox"/> ARMY RESERVE <input type="checkbox"/> VOLUNTEER <input type="checkbox"/> PERMANENT <input type="checkbox"/> FOREIGN NATIONAL <input type="checkbox"/> SEASONAL <input type="checkbox"/> TEMPORARY <input type="checkbox"/> STUDENT <input type="checkbox"/> OTHER (Specify) _____	
<b>3. GENERAL INFORMATION</b>					
a. DATE OF ACCIDENT (month/day/year)	b. TIME OF ACCIDENT (Military time)  hrs	c. EXACT LOCATION OF ACCIDENT			d. CONTRACTOR'S NAME
e. CONTRACT NUMBER  <input type="checkbox"/> CIVIL WORKS <input type="checkbox"/> MILITARY <input type="checkbox"/> OTHER (Specify) _____		f. TYPE OF CONTRACT <input type="checkbox"/> CONSTRUCTION <input type="checkbox"/> SERVICE <input type="checkbox"/> A/E <input type="checkbox"/> DREDGE <input type="checkbox"/> OTHER (Specify) _____		g. HAZARDOUS/TOXIC WASTE ACTIVITY <input type="checkbox"/> SUPERFUND <input type="checkbox"/> DERP <input type="checkbox"/> IRP <input type="checkbox"/> OTHER (Specify) _____	
(1) PRIME:  (2) SUBCONTRACTOR:					
<b>4. CONSTRUCTION ACTIVITIES ONLY (Fill in line and corresponding code number in box from list - see help menu)</b>					
a. CONSTRUCTION ACTIVITY		b. TYPE OF CONSTRUCTION EQUIPMENT			
(CODE) #		(CODE) #			
<b>5. INJURY/ILLNESS INFORMATION (Include name on line and corresponding code number in box for items e, f &amp; g - see help menu)</b>					
a. SEVERITY OF ILLNESS/INJURY		b. ESTIMATED DAYS LOST	c. ESTIMATED DAYS HOSPITALIZED	d. ESTIMATED DAYS RESTRICTED DUTY	
(CODE) #					
e. BODY PART AFFECTED		g. TYPE AND SOURCE OF INJURY/ILLNESS			
PRIMARY (CODE) #		TYPE (CODE) #			
SECONDARY (CODE) #		SOURCE (CODE) #			
f. NATURE OF ILLNESS / INJURY (CODE) #					
<b>6. PUBLIC FATALITY (Fill in line and correspondence code number in box - see help menu)</b>					
a. ACTIVITY AT TIME OF ACCIDENT (CODE) #		b. PERSONAL FLOATATION DEVICE USED? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A			
<b>7. MOTOR VEHICLE ACCIDENT</b>					
a. TYPE OF VEHICLE		b. TYPE OF COLLISION		c. SEAT BELTS	USED    NOT USED    NOT AVAILABLE
<input type="checkbox"/> PICKUP/VAN <input type="checkbox"/> AUTOMOBILE <input type="checkbox"/> TRUCK <input type="checkbox"/> OTHER (Specify) _____		<input type="checkbox"/> SIDE SWIPE <input type="checkbox"/> HEAD ON <input type="checkbox"/> REAR END <input type="checkbox"/> BROADSIDE <input type="checkbox"/> ROLL OVER <input type="checkbox"/> BACKING <input type="checkbox"/> OTHER (Specify) _____		(1) FRONT SEAT	
				(2) REAR SEAT	
<b>8. PROPERTY/MATERIAL INVOLVED</b>					
a. NAME OF ITEM		b. OWNERSHIP		c. \$ AMOUNT OF DAMAGE	
(1)					
(2)					
(3)					
<b>9. VESSEL/FLOATING PLANT ACCIDENT (Fill in line and correspondence code number in box from list - see help menu)</b>					
a. TYPE OF VESSEL/FLOATING PLANT (CODE) #		b. TYPE OF COLLISION/MISHAP (CODE) #			
<b>10. ACCIDENT DESCRIPTION (Use additional paper, if necessary)</b>					
See attached page.					

<b>11. CAUSAL FACTOR(S) (Read Instruction Before Completing)</b>			
<b>a. (Explain YES answers in item 13)</b>  DESIGN: Was design of facility, workplace or equipment a factor? <input type="checkbox"/> YES <input type="checkbox"/> NO  INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor? <input type="checkbox"/> YES <input type="checkbox"/> NO  PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor? <input type="checkbox"/> YES <input type="checkbox"/> NO  OPERATING PROCEDURES: Were operating procedures a factor? <input type="checkbox"/> YES <input type="checkbox"/> NO  JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred? <input type="checkbox"/> YES <input type="checkbox"/> NO  HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident? <input type="checkbox"/> YES <input type="checkbox"/> NO  ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident? <input type="checkbox"/> YES <input type="checkbox"/> NO	<b>a. (CONTINUED)</b>  CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident? <input type="checkbox"/> YES <input type="checkbox"/> NO  OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident? <input type="checkbox"/> YES <input type="checkbox"/> NO  SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task? <input type="checkbox"/> YES <input type="checkbox"/> NO  PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident? <input type="checkbox"/> YES <input type="checkbox"/> NO  DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident? <input type="checkbox"/> YES <input type="checkbox"/> NO	<b>b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?</b>  <input type="checkbox"/> YES (If yes, attach a copy.) <input type="checkbox"/> NO	
<b>12. TRAINING</b>			
<b>a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?</b>  <input type="checkbox"/> YES <input type="checkbox"/> NO	<b>b. TYPE OF TRAINING.</b>  <input type="checkbox"/> CLASSROOM <input type="checkbox"/> ON JOB	<b>c. DATE OF MOST RECENT FORMAL TRAINING.</b>  (Month) (Day) (Year)	
<b>13. FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES (See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)</b>			
<b>a. DIRECT CAUSE</b>  <div style="text-align: center;">See attached page.</div>			
<b>b. INDIRECT CAUSE(S)</b>  <div style="text-align: center;">See attached page.</div>			
<b>14. ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).</b>			
<b>DESCRIBE FULLY:</b>  <div style="text-align: center;">See attached page.</div>			
<b>15. DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.</b>			
<b>a. BEGINNING (Month/Day/Year)</b>		<b>b. ANTICIPATED COMPLETION (Month/Day/Year)</b>	
<b>c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT</b> CORPS _____ CONTRACTOR _____		<b>d. DATE (Mo/Da/Yr)</b>	<b>e. ORGANIZATION IDENTIFIER (Div, Br, Sect)</b>
		<b>f. OFFICE SYMBOL</b>	
<b>16. MANAGEMENT REVIEW (1st)</b>			
<b>a. <input type="checkbox"/> CONCUR    b. <input type="checkbox"/> NON CONCUR    c. COMMENTS</b>			
SIGNATURE		TITLE	DATE
<b>17. MANAGEMENT REVIEW (2nd - Chief Operations, Construction, Engineering, etc.)</b>			
<b>a. <input type="checkbox"/> CONCUR    b. <input type="checkbox"/> NON CONCUR    c. COMMENTS</b>			
SIGNATURE		TITLE	DATE
<b>18. SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW</b>			
<b>a. <input type="checkbox"/> CONCUR    b. <input type="checkbox"/> NON CONCUR    c. ADDITIONAL ACTIONS/COMMENTS</b>			
SIGNATURE		TITLE	DATE
<b>19. COMMAND APPROVAL</b>			
COMMENTS			
COMMANDER SIGNATURE			DATE

10.

**ACCIDENT DESCRIPTION (Continuation)**

**DIRECT CAUSE (Continuation)**

13b.

**INDIRECT CAUSES** *(Continuation)*

14.

**ACTION(S) TAKEN, ANTICIPATED, OR RECOMMENDED TO ELIMINATE CAUSE(S)** *(Continuation)*

**GENERAL.** Complete a separate report for each person who was injured, caused, or contributed to the accident (excluding uninjured personnel and witnesses). Use of this form for reporting USACE employee first-aid type injuries not submitted to the Office of Workers' Compensation Programs (OWCP) shall be at the discretion of the FOA commander. Please type or print legibly. Appropriate items shall be marked with an "X" in box(es). If additional space is needed, provide the information on a separate sheet and attach to the completed form. Ensure that these instructions are forwarded with the completed report to the designated management reviewers indicated in sections 16. and 17.

## INSTRUCTIONS FOR SECTION 1 — ACCIDENT CLASSIFICATION. (Mark All Boxes That Are Applicable.)

- a. **GOVERNMENT.** Mark "CIVILIAN" box if accident involved government civilian employee; mark "MILITARY" box if accident involved U.S. military personnel.
  - (1) **INJURY/ILLNESS/FATALITY** — Mark if accident resulted in any government civilian employee injury, illness, or fatality that requires the submission of OWCP Forms CA-1 (injury), CA-2 (illness), or CA-6 (fatality) to OWCP; mark if accident resulted in military personnel lost-time or fatal injury or illness.
  - (2) **PROPERTY DAMAGE** — Mark the appropriate box if accident resulted in any damage of \$1000 or more to government property (including motor vehicles).
  - (3) **VEHICLE INVOLVED** — Mark if accident involved a motor vehicle, regardless of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.
  - (4) **DIVING ACTIVITY** — Mark if the accident involved an in-house USACE diving activity.
- b. **CONTRACTOR.**
  - (1) **INJURY/ILLNESS/FATALITY** — Mark if accident resulted in any contractor lost-time injury/illness or fatality.
  - (2) **PROPERTY DAMAGE** — Mark the appropriate box if accident resulted in any damage of \$1000 or more to contractor property (including motor vehicles).
  - (3) **VEHICLE INVOLVED** — Mark if accident involved a motor vehicle, regardless of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.
  - (4) **DIVING ACTIVITY** — Mark if the accident involved a USACE Contractor diving activity.
- c. **PUBLIC.**
  - (1) **INJURY/ILLNESS/FATALITY** — Mark if accident resulted in public fatality or permanent total disability. (The "OTHER" box will be marked when requested by the FOA to report an unusual non-fatal public accident that could result in claims against the government or as otherwise directed by the FOA Commander).
  - (2) **VOID SPACE** — Make no entry.
  - (3) **VEHICLE INVOLVED** — Mark if accident resulted in a fatality to a member of the public and involved a motor vehicle, regardless of whether "INJURY/ILLNESS/FATALITY" is marked.
  - (4) **VOID SPACE** — Make no entry.

## INSTRUCTIONS FOR SECTION 2 — PERSONAL DATA

- a. **NAME** — (MANDATORY FOR GOVERNMENT ACCIDENTS. OPTIONAL AT THE DISCRETION OF THE FOA COMMANDER FOR CONTRACTOR AND PUBLIC ACCIDENTS). Enter last name, first name, middle initial of person involved.
- b. **AGE** — Enter age.
- c. **SEX** — Mark appropriate box.
- d. **SOCIAL SECURITY NUMBER** — (FOR GOVERNMENT PERSONNEL ONLY) Enter the social security number (or other personal identification number if no social security number issued).
- GRADE** — (FOR GOVERNMENT PERSONNEL ONLY) Enter pay grade. Example: O-6; E-7; WG-8; WS-12; GS-11; etc.

- f. **JOB SERIES/TITLE** — For government civilian employees enter the pay plan, full series number, and job title, e.g. GS-0810/Civil Engineer. For military personnel enter the primary military occupational specialty (PMOS), e.g., 15A30 or 11G50. For contractor employees enter the job title assigned to the injured person, e.g. carpenter, laborer, surveyor, etc..
- g. **DUTY STATUS** — Mark the appropriate box.
  - (1) **ON DUTY** — Person was at duty station during duty hours or person was away from duty station during duty hours but on official business at time of the accident.
  - (2) **TDY** — Person was on official business, away from the duty station and with travel orders at time of accident. Line-of-duty investigation required.
  - (3) **OFF DUTY** — Person was not on official business at time of accident
- h. **EMPLOYMENT STATUS** — (FOR GOVERNMENT PERSONNEL ONLY) Mark the most appropriate box. If "OTHER" is marked, specify the employment status of the person.

## INSTRUCTION FOR SECTION 3 — GENERAL INFORMATION

- a. **DATE OF ACCIDENT** — Enter the month, day, and year of accident.
- b. **TIME OF ACCIDENT** — Enter the local time of accident in military time. Example: 1430 hrs (not 2:30 p.m.).
- c. **EXACT LOCATION OF ACCIDENT** — Enter facts needed to locate the accident scene. (installation/project name, building number, street, direction and distance from closest landmark, etc..).
- d. **CONTRACTOR NAME**
  - (1) **PRIME** — Enter the exact name (title of firm) of the prime contractor.
  - (2) **SUBCONTRACTOR** — Enter the name of any subcontractor involved in the accident.
- e. **CONTRACT NUMBER** — Mark the appropriate box to identify if contract is civil works, military, or other: if "OTHER" is marked, specify contract appropriation on line provided. Enter complete contract number of prime contract, e.g., DACW 09-85-C-0100.
- f. **TYPE OF CONTRACT** — Mark appropriate box. A/E means architect/engineer. If "OTHER" is marked, specify type of contract on line provided.
- g. **HAZARDOUS/TOXIC WASTE ACTIVITY (HTW)** — Mark the box to identify the HTW activity being performed at the time of the accident. For Superfund, DERP, and Installation Restoration Program (IRP) HTW activities include accidents that occurred during inventory, predesign, design, and construction. For the purpose of accident reporting, DERP Formerly Used DoD Site (FUDS) activities and IRP activities will be treated separately. For Civil Works O&M HTW activities mark the "OTHER" box.

## INSTRUCTIONS FOR SECTION 4 — CONSTRUCTION ACTIVITIES

- a. **CONSTRUCTION ACTIVITY** — Select the most appropriate construction activity being performed at time of accident from the list below. Enter the activity name and place the corresponding code number identified in the box.

### CONSTRUCTION ACTIVITY LIST

- |                         |                            |
|-------------------------|----------------------------|
| 1. MOBILIZATION         | 14. ELECTRICAL             |
| 2. SITE PREPARATION     | 15. SCAFFOLDING/ACCESS     |
| 3. EXCAVATION/TRENCHING | 16. MECHANICAL             |
| 4. GRADING (EARTHWORK)  | 17. PAINTING               |
| 5. PIPING/UTILITIES     | 18. EQUIPMENT/MAINTENANCE  |
| 6. FOUNDATION           | 19. TUNNELING              |
| 7. FORMING              | 20. WAREHOUSING/STORAGE    |
| 8. CONCRETE PLACEMENT   | 21. PAVING                 |
| 9. STEEL ERECTION       | 22. FENCING                |
| 10. ROOFING             | 23. SIGNING                |
| 11. FRAMING             | 24. LANDSCAPING/IRRIGATION |
| 12. MASONRY             | 25. INSULATION             |
| 13. CARPENTRY           | 26. DEMOLITION             |

- b. TYPE OF CONSTRUCTION EQUIPMENT—Select the equipment involved in the accident from the list below. Enter the name and place the corresponding code number identified in the box. If equipment is not included below, use code 24, "OTHER", and write in specific type of equipment.

#### CONSTRUCTION EQUIPMENT

- |                                    |                                |
|------------------------------------|--------------------------------|
| 1. GRADER                          | 13. DUMP TRUCK (OFF HIGHWAY)   |
| 2. DRAGLINE                        | 14. TRUCK (OTHER)              |
| 3. CRANE (ON VESSEL/BARGE)         | 15. FORKLIFT                   |
| 4. CRANE (TRACKED)                 | 16. BACKHOE                    |
| 5. CRANE (RUBBER TIRE)             | 17. FRONT-END LOADER           |
| 6. CRANE (VEHICLE MOUNTED)         | 18. PILE DRIVER                |
| 7. CRANE (TOWER)                   | 19. TRACTOR (UTILITY)          |
| 8. SHOVEL                          | 20. MANLIFT                    |
| 9. SCRAPER                         | 21. DOZER                      |
| 10. PUMP TRUCK (CONCRETE)          | 22. DRILL RIG                  |
| 11. TRUCK (CONCRETE/TRANSIT MIXER) | 23. COMPACTOR/VIBRATORY ROLLER |
| 12. DUMP TRUCK (HIGHWAY)           | 24. OTHER                      |

#### INSTRUCTIONS FOR SECTION 5—INJURY/ILLNESS INFORMATION

- a. SEVERITY OF INJURY / ILLNESS - Reference para 2-10 of USACE Suppl 1 to AR 385-40 and enter code and description from list below.

NOI NO INJURY  
 FAT FATALITY  
 PTL PERMANENT TOTAL DISABILITY  
 PPR PERMANENT PARTIAL DISABILITY  
 LWD LOST WORKDAY CASE INVOLVING DAYS AWAY FROM WORK  
 NLW RECORDABLE CASE WITHOUT LOST WORKDAYS  
 RFA RECORDABLE FIRST AID CASE  
 NRI NON-RECORDABLE INJURY

- b. ESTIMATED DAYS LOST—Enter the estimated number of workdays the person will lose from work.
- c. ESTIMATED DAYS HOSPITALIZED—Enter the estimated number of workdays the person will be hospitalized.
- d. ESTIMATED DAYS RESTRICTED DUTY—Enter the estimated number of workdays the person, as a result of the accident, will not be able to perform all of their regular duties.
- e. BODY PART AFFECTED—Select the most appropriate primary and when applicable, secondary body part affected from the list below. Enter body part name on line and place the corresponding code letters identifying that body part in the box.

GENERAL BODY AREA	CODE	BODY PART NAME
ARM/WRIST	AB	ARM AND WRIST
	AS	ARM OR WRIST
TRUNK, EXTERNAL MUSCULATURE	B1	SINGLE BREAST
	B2	BOTH BREASTS
	B3	SINGLE TESTICLE
	B4	BOTH TESTICLES
	BA	ABDOMEN
	BC	CHEST
	BL	LOWER BACK
	BP	PENIS
	BS	SIDE
	BU	UPPER BACK
	BW	WAIST
	BZ	TRUNK OTHER
HEAD, INTERNAL	C1	SINGLE EAR INTERNAL
	C2	BOTH EARS INTERNAL
	C3	SINGLE EYE INTERNAL
	C4	BOTH EYES INTERNAL
	CB	BRAIN
	CC	CRANIAL BONES
	CD	TEETH
	CJ	JAW
	CL	THROAT, LARYNX
	CM	MOUTH

ELBOW

FINGER

TOE

HEAD, EXTERNAL

KNEE

LEG, HIP, ANKLE, BUTTOCK

HAND

FOOT

TRUNK, BONES

SHOULDER

THUMB

TRUNK, INTERNAL ORGANS

CN	NOSE
CR	THROAT, OTHER
CT	TONGUE
CZ	HEAD OTHER INTERNAL
EB	BOTH ELBOWS
ES	SINGLE ELBOW
F1	FIRST FINGER
F2	BOTH FIRST FINGERS
F3	SECOND FINGER
F4	BOTH SECOND FINGERS
F5	THIRD FINGER
F6	BOTH THIRD FINGERS
F7	FOURTH FINGER
F8	BOTH FOURTH FINGERS
G1	GREAT TOE
G2	BOTH GREAT TOES
G3	TOE OTHER
G4	TOES OTHER
H1	EYE EXTERNAL
H2	BOTH EYES EXTERNAL
H3	EAR EXTERNAL
H4	BOTH EARS EXTERNAL
HC	CHIN
HF	FACE
HK	NECK/THROAT
HM	NOSE/LIPS
HN	NOSE
HS	SCALP
KB	BOTH KNEES
KS	KNEE
LB	BOTH LEGS/HIPS/ANKLES/BUTTOCKS
LS	SINGLE LEG/HIP/ANKLE/BUTTOCK
MB	BOTH HANDS
MS	SINGLE HAND
PB	BOTH FEET
PS	SINGLE FOOT
R1	SINGLE COLLAR BONE
R2	BOTH COLLAR BONES
R3	SHOULDER BLADE
R4	BOTH SHOULDER BLADES
RB	RIB
RS	STERNUM (BREAST BONE)
RV	VERTEBRAE (SPINE; DISC)
RZ	TRUNK BONES OTHER
SB	BOTH SHOULDERS
SS	SINGLE SHOULDER
TB	BOTH THUMBS
TS	SINGLE THUMB
V1	LUNG, SINGLE
V2	LUNGS, BOTH
V3	KIDNEY, SINGLE
V4	KIDNEYS, BOTH
VH	HEART
VL	LIVER
VR	REPRODUCTIVE ORGANS
VS	STOMACH
VV	INTESTINES
VZ	TRUNK, INTERNAL; OTHER

- f. NATURE OF INJURY/ILLNESS - Select the most appropriate nature of injury / illness from the list below. This nature of injury / illness shall correspond to the primary body part selected in 5e, above. Enter the nature of injury / illness name on the line and place the corresponding CODE letters in the box provided.

\* The injury or condition selected below must be caused by a specific incident or event which occurred during a single work day or shift.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
*TRAUMATIC INJURY OR DISABILITY	TA	AMPUTATION
	TB	BACK STRAIN.
	TC	CONTUSION; BRUISE; ABRASION
	TD	DISLOCATION
	TF	FRACTURE
	TH	HERNIA
	TK	CONCUSSION
	TL	LACERATION, CUT
	TP	PUNCTURE
	TS	STRAIN, MULTIPLE
	TU	BURN, SCALD, SUNBURN
	TI	TRAUMATIC SKIN DISEASES/ CONDITIONS INCLUDING DERMATITIS
	TR	TRAUMATIC RESPIRATORY DISEASE
	TQ	TRAUMATIC FOOD POISONING
	TW	TRAUMATIC TUBERCULOSIS
	TX	TRAUMATIC VIROLOGICAL/ INFECTIVE/PARASITIC DISEASE
	T1	TRAUMATIC CEREBRAL VASCULAR CONDITION/STROKE
	T2	TRAUMATIC HEARING LOSS
	T3	TRAUMATIC HEART CONDITION
	T4	TRAUMATIC MENTAL DISORDER; STRESS; NERVOUS CONDITION
	T8	TRAUMATIC INJURY - OTHER (EXCEPT DISEASE, ILLNESS)

\*\*A nontraumatic physiological harm or loss of capacity produced by systemic infection; continued or repeated stress or strain; exposure to toxins, poisons, fumes, etc.; or other continued and repeated exposures to conditions of the work environment over a long period of time. For practical purposes, an occupational illness/disease or disability is any reported condition which does not meet the definition of traumatic injury or disability as described above.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
**NON-TRAUMATIC ILLNESS/DISEASE OR DISABILITY		
RESPIRATORY DISEASE	RA	ASBESTOSIS
	RB	BRONCHITIS
	RE	EMPHYSEMA
	RP	PNEUMOCONIOSIS
	RS	SILICOSIS
	R9	RESPIRATORY DISEASE, OTHER
VIROLOGICAL, INFECTIVE & PARASITIC DISEASES	VB	BRUCELLOSIS
	VC	COCCIDIOMYCOSIS
	VF	FOOD POISONING
	VH	HEPATITIS
	VM	MALARIA
	VS	STAPHYLOCOCCUS
	VT	TUBERCULOSIS
	V9	VIROLOGICAL/INFECTIVE/ PARASITIC - OTHER
DISABILITY, OCCUPATIONAL	DA	ARTHRITIS, BURSITIS
	DB	BACK STRAIN, BACK SPRAIN
	DC	CEREBRAL VASCULAR CONDITION; STROKE
	DD	ENDEMIC DISEASE (OTHER THAN CODE TYPES R&S)
	DE	EFFECT OF ENVIRONMENTAL CONDITION
	DH	HEARING LOSS
	DK	HEART CONDITION
	DM	MENTAL DISORDER, EMOTIONAL STRESS NERVOUS CONDITION
	DR	RADIATION
	DS	STRAIN, MULTIPLE
	DU	ULCER
	DV	OTHER VASCULAR CONDITIONS
	D9	DISABILITY, OTHER

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
SKIN DISEASE OR CONDITION	SB	BIOLOGICAL
	SC	CHEMICAL
	S9	DERMATITIS, UNCLASSIFIED

g. TYPE AND SOURCE OF INJURY/ILLNESS (CAUSE) - Type and Source Codes are used to describe what caused the incident. The Type Code stands for an ACTION and the Source Code for an OBJECT or SUBSTANCE. Together, they form a brief description of how the incident occurred. Where there are two different sources, code the initiating source of the incident (see example 1, below). Examples:

- (1) An employee tripped on carpet and struck his head on a desk.  
TYPE: 210 (fell on same level) SOURCE: 0110 (walking/working surface)  
NOTE: This example would NOT be coded 120 (struck against) and 0140 (furniture).
- (2) A Park Ranger contracted dermatitis from contact with poison ivy/oak.  
TYPE: 510 (contact) SOURCE: 0920 (plant)
- (3) A lock and dam mechanic punctured his finger with a metal sliver while grinding a turbine blade.  
TYPE: 410 (punctured by) SOURCE: 0830 (metal)
- (4) An employee was driving a government vehicle when it was struck by another vehicle.  
TYPE: 800 (traveling in) SOURCE: 0421 (government-owned vehicle, as driver)

NOTE: The Type Code 800, "Traveling In" is different from the other type codes in that its function is not to identify factors contributing to the injury or fatality, but rather to collect data on the type of vehicle the employee was operating or traveling in at the time of the incident.

Select the most appropriate TYPE and SOURCE identifier from the list below and enter the name on the line and the corresponding code in the appropriate box.

CODE	TYPE OF INJURY NAME
	STRUCK
0110	STRUCK BY
0111	STRUCK BY FALLING OBJECT
0120	STRUCK AGAINST
	FELL, SLIPPED, TRIPPED
0210	FELL ON SAME LEVEL
0220	FELL ON DIFFERENT LEVEL
0230	SLIPPED, TRIPPED (NO FALL)
	CAUGHT
0310	CAUGHT ON
0320	CAUGHT IN
0330	CAUGHT BETWEEN
	PUNCTURED, LACERATED
0410	PUNCTURED BY
0420	CUT BY
0430	STUNG BY
0440	BITTEN BY
	CONTACTED
0510	CONTACTED WITH (INJURED PERSON MOVING)
0520	CONTACTED BY (OBJECT WAS MOVING)
	EXERTED
0610	LIFTED, STRAINED BY (SINGLE ACTION)
0620	STRESSED BY (REPEATED ACTION)
	EXPOSED
0710	INHALED
0720	INGESTED
0730	ABSORBED
0740	EXPOSED TO
0800	TRAVELING IN
CODE	SOURCE OF INJURY NAME
0100	BUILDING OR WORKING AREA
0110	WALKING/WORKING SURFACE (FLOOR, STREET, SIDEWALKS, ETC)
0120	STAIRS, STEPS
0130	LADDER
0140	FURNITURE, FURNISHINGS, OFFICE EQUIPMENT
0150	BOILER, PRESSURE VESSEL
0160	EQUIPMENT LAYOUT (ERGONOMIC)
0170	WINDOWS, DOORS
0180	ELECTRICITY

CODE	SOURCE OF INJURY NAME
0200	ENVIRONMENTAL CONDITION
0210	TEMPERATURE EXTREME (INDOOR)
0220	WEATHER (ICE, RAIN, HEAT, ETC.)
0230	FIRE, FLAME, SMOKE (NOT TOBACCO)
0240	NOISE
0250	RADIATION
0260	LIGHT
0270	VENTILATION
0271	TOBACCO SMOKE
0280	STRESS (EMOTIONAL)
0290	CONFINED SPACE
0300	MACHINE OR TOOL
0310	HAND TOOL (POWERED: SAW, GRINDER, ETC.)
0320	HAND TOOL (NONPOWERED)
0330	MECHANICAL POWER TRANSMISSION APPARATUS
0340	GUARD, SHIELD (FIXED, MOVEABLE, INTERLOCK)
0350	VIDEO DISPLAY TERMINAL
0360	PUMP, COMPRESSOR, AIR PRESSURE TOOL
0370	HEATING EQUIPMENT
0380	WELDING EQUIPMENT
0400	VEHICLE
0411	AS DRIVER OF PRIVATELY OWNED/RENTAL VEHICLE
0412	AS PASSENGER OF PRIVATELY OWNED/RENTAL VEHICLE
0421	DRIVER OF GOVERNMENT VEHICLE
0422	PASSENGER OF GOVERNMENT VEHICLE
0430	COMMON CARRIER (AIRLINE, BUS, ETC.)
0440	AIRCRAFT (NOT COMMERCIAL)
0450	BOAT, SHIP, BARGE
0500	MATERIAL HANDLING EQUIPMENT
0510	EARTHMOVER (TRACTOR, BACKHOE, ETC.)
0520	CONVEYOR (FOR MATERIAL AND EQUIPMENT)
0530	ELEVATOR, ESCALATOR, PERSONNEL HOIST
0540	HOIST, SLING CHAIN, JACK
0550	CRANE
0551	FORKLIFT
0560	HANDTRUCK, DOLLY
0600	DUST, VAPOR, ETC.
0610	DUST (SILICA, COAL, ETC.)
0620	FIBERS
0621	ASBESTOS
0630	GASES
0631	CARBON MONOXIDE
0640	MIST, STEAM, VAPOR, FUME
0641	WELDING FUMES
0650	PARTICLES (UNIDENTIFIED)
0700	CHEMICAL, PLASTIC, ETC.
0711	DRY CHEMICAL—CORROSIVE
0712	DRY CHEMICAL—TOXIC
0713	DRY CHEMICAL—EXPLOSIVE
0714	DRY CHEMICAL—FLAMMABLE
0721	LIQUID CHEMICAL—CORROSIVE
0722	LIQUID CHEMICAL—TOXIC
0723	LIQUID CHEMICAL—EXPLOSIVE
0724	LIQUID CHEMICAL—FLAMMABLE
0730	PLASTIC
0740	WATER
0750	MEDICINE
0800	INANIMATE OBJECT
0810	BOX, BARREL, ETC.
0820	PAPER
0830	METAL ITEM, MINERAL
0831	NEEDLE
0840	GLASS
0850	SCRAP, TRASH
0860	WOOD
0870	FOOD
0880	CLOTHING, APPAREL, SHOES
0900	ANIMATE OBJECT
0911	DOG
0912	OTHER ANIMAL
0920	PLANT
0930	INSECT
0940	HUMAN (VIOLENCE)
0950	HUMAN (COMMUNICABLE DISEASE)
0960	BACTERIA, VIRUS (NOT HUMAN CONTACT)

CODE	SOURCE OF INJURY NAME
1000	PERSONAL PROTECTIVE EQUIPMENT
1010	PROTECTIVE CLOTHING, SHOES, GLASSES, GOGGLES
1020	RESPIRATOR, MASK
1021	DIVING EQUIPMENT
1030	SAFETY BELT, HARNESS
1040	PARACHUTE

## INSTRUCTIONS FOR SECTION 6 — PUBLIC FATALITY

- a. **ACTIVITY AT TIME OF ACCIDENT**—Select the activity being performed at the time of the accident from the list below. Enter the activity name on the line and the corresponding number in the box. If the activity performed is not identified on the list, select from the most appropriate primary activity area (water related, non-water related or other activity), the code number for "Other", and write in the activity being performed at the time of the accident.

### WATER RELATED RECREATION

- |                                   |  |
|-----------------------------------|--|
| 1. Sailing                        | 9. Swimming/designated area                          |
| 2. Boating—powered                | 10. Swimming/other area                              |
| 3. Boating—unpowered              | 11. Underwater activities (skin diving, scuba, etc.) |
| 4. Water skiing                   | 12. Wading   |
| 5. Fishing from boat              | 13. Attempted rescue                                 |
| 6. Fishing from bank dock or pier | 14. Hunting from boat                                |
| 7. Fishing while wading           | 15. Other  |
| 8. Swimming/supervised area       |  |

### NON-WATER RELATED RECREATION

- |  |   |
|--|---|
| 16. Hiking and walking                   | 23. Sports/summer (baseball, football, etc.)            |
| 17. Climbing (general)                   | 24. Sports/winter (skiing, sledding, snowmobiling etc.) |
| 18. Camping/picnicking authorized area   | 25. Cycling (bicycle, motorcycle, scooter)              |
| 19. Camping/picnicking unauthorized area | 26. Gliding   |
| 20. Guided tours                         | 27. Parachuting   |
| 21. Hunting                              | 28. Other non-water related                             |
| 22. Playground equipment                 |   |

### OTHER ACTIVITIES

- |  |                                  |
|--|----------------------------------|
| 29. Unlawful acts (fights, riots, vandalism, etc.) | 33. Sleeping                     |
| 30. Food preparation/serving                       | 34. Pedestrian struck by vehicle |
| 31. Food consumption                               | 35. Pedestrian other acts        |
| 32. Housekeeping                                   | 36. Suicide                      |
|  | 37. "Other" activities           |

- b. **PERSONAL FLOTATION DEVICE USED**—If fatality was water-related was the victim wearing a person flotation device? Mark the appropriate box.

## INSTRUCTIONS FOR SECTION 7—MOTOR VEHICLE ACCIDENT

- a. **TYPE OF VEHICLE**—Mark appropriate box for each vehicle involved. If more than one vehicle of the same type is involved, mark both halves of the appropriate box. USACE vehicle(s) involved shall be marked in left half of appropriate box.
- b. **TYPE OF COLLISION**—Mark appropriate box.
- c. **SEAT BELT**—Mark appropriate box.

## INSTRUCTIONS FOR SECTION 8—PROPERTY/ MATERIAL INVOLVED

- a. **NAME OF ITEM**—Describe all property involved in accident. Property/material involved means material which is damaged or whose use or misuse contributed to the accident. Include the name, type, model; also include the National Stock Number (NSN) whenever applicable.
- b. **OWNERSHIP**—Enter ownership for each item listed. (Enter one of the following: USACE; OTHER GOVERNMENT; CONTRACTOR; PRIVATE)
- c. **\$ AMOUNT OF DAMAGE**—Enter the total estimated dollar amount of damage (parts and labor), if any.

## INSTRUCTIONS FOR SECTION 9—VESSEL/ FLOATING PLANT ACCIDENT

- a. TYPE OF VESSEL/FLOATING PLANT—Select the most appropriate vessel/floating plant from list below. Enter name and place corresponding number in box. If item is not listed below, enter item number for "OTHER" and write in specific type of vessel/floating plant.

### VESSEL/FLOATING PLANTS

- |                        |                             |
|------------------------|-----------------------------|
| 1. ROW BOAT            | 7. DREDGE/DIPPER            |
| 2. SAIL BOAT           | 8. DREDGE/CLAMSHELL, BUCKET |
| 3. MOTOR BOAT          | 9. DREDGE/PIPE LINE         |
| 4. BARGE               | 10. DREDGE/DUST PAN         |
| 5. DREDGE/HOPPER       | 11. TUG BOAT                |
| 6. DREDGE/SIDE CASTING | 12. OTHER                   |

- b. COLLISION/MISHAP—Select from the list below the object(s) that contributed to the accident or were damaged in the accident.

### COLLISION/MISHAP

- |                             |                       |
|-----------------------------|-----------------------|
| 1. COLLISION W/OTHER VESSEL | 7. HAULAGE UNIT       |
| 2. UPPER GUIDE WALL         | 8. BREAKING TOW       |
| 3. UPPER LOCK GATES         | 9. TOW BREAKING UP    |
| 4. LOCK WALL                | 10. SWEEP DOWN ON DAM |
| 5. LOWER LOCK GATES         | 11. BUOY/DOLPHIN/CELL |
| 6. LOWER GUIDE WALL         | 12. WHARF OR DOCK     |
|                             | 13. OTHER             |

## INSTRUCTIONS FOR SECTION 10—ACCIDENT DESCRIPTION

DESCRIBE ACCIDENT—Fully describe the accident. Give the sequence of events that describe what happened leading up to and including the accident. Fully identify personnel and equipment involved and their role(s) in the accident. Ensure that relationships between personnel and equipment are clearly specified. Continue on blank sheets if necessary and attach to this report.

## INSTRUCTIONS FOR SECTION 11—CAUSAL FACTORS

- a. Review thoroughly. Answer each question by marking the appropriate block. If any answer is yes, explain in item 13 below. Consider, as a minimum, the following:

- (1) DESIGN—Did inadequacies associated with the building or work site play a role? Would an improved design or layout of the equipment or facilities reduce the likelihood of similar accidents? Were the tools or other equipment designed and intended for the task at hand?
- (2) INSPECTION/MAINTENANCE—Did inadequately or improperly maintained equipment, tools, workplace, etc. create or worsen any hazards that contributed to the accident? Would better equipment, facility, work site or work activity inspections have helped avoid the accident?
- (3) PERSON'S PHYSICAL CONDITION—Do you feel that the accident would probably not have occurred if the employee was in "good" physical condition? If the person involved in the accident had been in better physical condition, would the accident have been less severe or avoided altogether? Was over exertion a factor?
- (4) OPERATING PROCEDURES—Did a lack of or inadequacy within established operating procedures contribute to the accident? Did any aspect of the procedures introduce any hazard to, or increase the risk associated with the work process? Would establishment or improvement of operating procedures reduce the likelihood of similar accidents?
- (5) JOB PRACTICES—Were any of the provisions of the Safety and Health Requirements Manual (EM 385-1-1) violated? Was the task being accomplished in a manner which was not in compliance with an established job hazard analysis or activity hazard analysis? Did any established job practice (including EM 385-1-1) fail to adequately address the task or work process? Would better job practices improve the safety of the task?

- (6) HUMAN FACTORS—Was the person under undue stress (either internal or external to the job)? Did the task tend toward overloading the capabilities of the person; i.e., did the job require tracking and reacting to many external inputs such as displays, alarms, or signals? Did the arrangement of the workplace tend to interfere with efficient task performance? Did the task require reach, strength, endurance, agility, etc., at or beyond the capabilities of the employee? Was the work environment ill-adapted to the person? Did the person need more training, experience, or practice in doing the task? Was the person inadequately rested to perform safely?

- (7) ENVIRONMENTAL FACTORS—Did any factors such as moisture, humidity, rain, snow, sleet, hail, ice, fog, cold, heat, sun, temperature changes, wind, tides, floods, currents, dust, mud, glare, pressure changes, lightning, etc., play a part in the accident?

- (8) CHEMICAL AND PHYSICAL AGENT FACTORS—Did exposure to chemical agents (either single shift exposure or long-term exposure) such as dusts, fibers (asbestos, etc.), silica, gases (carbon monoxide, chlorine, etc.), mists, steam, vapors, fumes, smoke, other particulates, liquid or dry chemicals that are corrosive, toxic, explosive or flammable, by-products of combustion or physical agents such as noise, ionizing radiation, non-ionizing radiation (UV radiation created during welding, etc.) contribute to the accident/incident?

- (9) OFFICE FACTORS—Did the fact that the accident occurred in an office setting or to an office worker have a bearing on its cause? For example, office workers tend to have less experience and training in performing tasks such as lifting office furniture. Did physical hazards within the office environment contribute to the hazard?

- (10) SUPPORT FACTORS—Was the person using an improper tool for the job? Was inadequate time available or utilized to safely accomplish the task? Were less than adequate personnel resources (in terms of employee skills, number of workers, and adequate supervision) available to get the job done properly? Was funding available, utilized, and adequate to provide proper tools, equipment, personnel, site preparation, etc?

- (11) PERSONAL PROTECTIVE EQUIPMENT—Did the person fail to use appropriate personal protective equipment (gloves, eye protection, hard-toed shoes, respirator, etc.) for the task or environment? Did protective equipment provided or worn fail to provide adequate protection from the hazard(s)? Did lack of or inadequate maintenance of protective gear contribute to the accident?

- (12) DRUGS/ALCOHOL—Is there any reason to believe the person's mental or physical capabilities, judgement, etc., were impaired or altered by the use of drugs or alcohol? Consider the effects of prescription medicine and over the counter medications as well as illicit drug use. Consider the effect of drug or alcohol induced "hangovers".

- b. WRITTEN JOB/ACTIVITY HAZARD ANALYSIS—Was a written Job/Activity Hazard Analysis completed for the task being performed at the time of the accident? Mark the appropriate box. If one was performed, attach a copy of the analysis to the report.

## INSTRUCTIONS FOR SECTION 12—TRAINING

- a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?—For the purpose of this section "trained" means the person has been provided the necessary information (either formal and/or on-the-job (OJT) training) to competently perform the activity/task in a safe and healthful manner.

- b. TYPE OF TRAINING—Mark the appropriate box that best indicates the type of training; (classroom or on-the-job) that the injured person received before the accident happened.

- c. DATE OF MOST RECENT TRAINING—Enter the month, day, and year of the last formal training completed that covered the activity-task being performed at the time of the accident.

## INSTRUCTIONS FOR SECTION 13 — CAUSES

- a. **DIRECT CAUSES** — The direct cause is that single factor which most directly lead to the accident. See examples below.
- b. **INDIRECT CAUSES** — Indirect causes are those factors which contributed to but did not directly initiate the occurrence of the accident.

Examples for section 13:

- a. Employee was dismantling scaffold and fell 12 feet from unguarded opening.  
*Direct cause:* failure to provide fall protection at elevation.  
*Indirect causes:* failure to enforce USACE safety requirements; improper training/motivation of employee (possibility that employee was not knowledgeable of USACE fall protection requirements or was lax in his attitude towards safety); failure to ensure provision of positive fall protection whenever elevated; failure to address fall protection during scaffold dismantling in phase hazard analysis.
- b. Private citizen had stopped his vehicle at intersection for red light when vehicle was struck in rear by USACE vehicle. (note USACE vehicle was in proper/safe working condition).  
*Direct cause:* failure of USACE driver to maintain control of and stop USACE vehicle within safe distance.  
*Indirect cause:* Failure of employee to pay attention to driving (defensive driving).

## INSTRUCTIONS FOR SECTION 14 — ACTION TO ELIMINATE CAUSE(S)

**DESCRIPTION** — Fully describe all the actions taken, anticipated, and recommended to eliminate the cause(s) and prevent reoccurrence of similar accidents/illnesses. Continue on blank sheets of paper if necessary to fully explain and attach to the completed report form.

## INSTRUCTIONS FOR SECTION 15 — DATES FOR ACTION

- a. **BEGIN DATE** — Enter the date when the corrective action(s) identified in Section 14 will begin.
- b. **COMPLETE DATE** — Enter the date when the corrective action(s) identified in Section 14 will be completed.
- c. **TITLE AND SIGNATURE** — Enter the title and signature of supervisor completing the accident report. For a GOVERNMENT employee accident/illness the immediate supervisor will complete and sign the report. For PUBLIC accidents the USACE Project Manager/Area Engineer responsible for the USACE property where the accident happened shall complete and sign the report. For CONTRACTOR accidents the Contractor's project manager shall complete and sign the report and provide to the USACE supervisor responsible for oversight of that contractor activity. This USACE Supervisor shall also sign the report. Upon entering the information required in 15.d, 15.e and 15.f below, the responsible USACE supervisor shall forward the report for management review as indicated in Section 16.
- d. **DATE SIGNED** — Enter the month, day, and year that the report was signed by the responsible supervisor.
- e. **ORGANIZATION NAME** — For GOVERNMENT employee accidents enter the USACE organization name (Division, Branch, Section, etc.) of the injured employee. For PUBLIC accidents enter the USACE organization name for the person identified in block 15.c. For CONTRACTOR accidents enter the USACE organization name for the USACE office responsible for providing contract administration oversight.

- f. **OFFICE SYMBOL** — Enter the latest complete USACE Office Symbol for the USACE organization identified in block 15.e.

## INSTRUCTIONS FOR SECTION 16 — MANAGEMENT REVIEW (1st)

**1ST REVIEW** — Each USACE FOA shall determine who will provide 1st management review. The responsible USACE supervisor in section 15.c shall forward the completed report to the USACE office designated as the 1st Reviewer by the FOA. Upon receipt, the Chief of the Office shall review the completed report, mark the appropriate box, provide substantive comments, sign, date, and forward to the FOA Staff Chief (2nd review) for review and comment.

## INSTRUCTIONS FOR SECTION 17 — MANAGEMENT REVIEW (2nd)

**2ND REVIEW** — The FOA Staff Chief (i.e., FOA Chief of Construction, Operations, Engineering, Planning, etc.) shall mark the appropriate box, review the completed report, provide substantive comments, sign, date, and return to the FOA Safety and Occupational Health Office.

## INSTRUCTIONS FOR SECTION 18 — SAFETY AND OCCUPATIONAL HEALTH REVIEW

**3RD REVIEW** — The FOA Safety and Occupational Health Office shall review the completed report, mark the appropriate box, ensure that any inadequacies, discrepancies, etc., are rectified by the responsible supervisor and management reviewers, provide substantive comments, sign, date and forward to the FOA Commander for review, comment, and signature.

## INSTRUCTION FOR SECTION 19 — COMMAND APPROVAL

**4TH REVIEW** — The FOA Commander shall (to include the person designated Acting Commander in his absence) review the completed report, comment if required, sign, date, and forward the report to the FOA Safety and Occupational Health Office. Signature authority shall not be delegated.

# CAPE ENVIRONMENTAL VEHICLE ACCIDENT REPORT

CAPE Vehicle	
Date / Time / Location:	
Driver Name:	Accident Date:
Drivers License #:	State:
Driver Address:	Project Location:
Vehicle Year/Make /Model:	
License Plate #:	State:
Vehicle Owner (Circle): Owned   Leased   Rented   Private	
Vehicle Owner Address:	Telephone:
Vehicle Damage:	Est. Repair Cost:
Other Vehicles	
Driver Name / Telephone:	
Drivers License #:	State
Drivers Address:	
Vehicle Owner Name / Telephone:	
Vehicle Owner Address:	
Insurance Co. / Telephone:	Policy #:
Address:	Agents Name:
Vehicle Year / Make / Model:	
License Plate #:	State:
Vehicle Damage:	
Passengers (list on back): Yes / No	Injuries (list on back): Yes / No
Accident Description	
Sketch Attached: Yes / No	Photos Attached: Yes / No
Description:	
Witness Information	
Witness Name:	Telephone:
Address:	
Statement Attached: Yes / No	
Police Report	
Police Department:	Date / Time Reported:
Telephone:	Police Report #:
Police Officer Name:	
Investigation and Review	
Report Prepared By / Date:	
Supervisor Name / Signature / Date:	

**ATTACHMENT 3**  
**ACTIVITY HAZARD ANALYSES**

# ACTIVITY HAZARD ANALYSIS

ACTIVITY: MOBILIZATION AND SITE PREPARATION	
Prepared By: Glen Mayekawa, CIH / Date: 7-29-05	Reviewed By: William Torres, EIT
WORK TASK	POTENTIAL HAZARDS
<ul style="list-style-type: none"> <li>-Mobilize personnel and equipment</li> <li>-Conduct safety orientation briefing &amp; SSHP review</li> <li>-Receive and inspect heavy equipment</li> <li>-Place stone to improve laydown &amp; site support areas</li> <li>-Set up office trailers and support utilities</li> <li>-Arrange for sanitary facilities and potable water</li> <li>-Install chain link fence around office compound</li> <li>-Perform utility clearance</li> <li>-Delineate work zones and set-up decon stations</li> <li>-Conduct clearing and grubbing</li> <li>-Install project signs and construction fence</li> <li>-Install erosion controls</li> <li>-Perform other site preparation tasks.</li> </ul>	<p><b>Chemical hazards:</b> No anticipated exposure to site contaminants during mobilization and site preparation activities.</p> <p><b>Biological hazards:</b> Potential exposure to poisonous plants, snakes, spiders, rodents, insects, ticks, and mosquitoes.</p> <p><b>Physical Hazards:</b> Potential exposure to physical hazards: Fire protection; underground and overhead utilities; heavy equipment operation; vehicle and equipment traffic; material handling; tools, machinery, and equipment use; electrical equipment and lockout/tagout; noise exposure; heat stress; cold stress; chain saw operation; inclement weather and adverse environmental conditions; miscellaneous physical hazards. <b>SEE RECOMMENDED HAZARD CONTROLS BELOW.</b></p>
RECOMMENDED HAZARD CONTROLS	
<p><b>Chemical Hazards:</b> <u>No expected exposure to site contaminants during this activity.</u> Observe for chemical hazards. Advise the SSHP if observed and potential for contact exists.</p>	
<p><b>Biological Hazards:</b> <u>Biological hazards may be present.</u> Watch for, and avoid contact with, poisonous plants, snakes, spiders, rodents, insects, ticks, and mosquitoes. Wear long-sleeved shirts and pants. Apply repellant containing 20% - 30% DEET if needed.</p>	
<p><b>Fire Protection:</b> <u>Gasoline and diesel fuel will be used for vehicles, heavy equipment, and machinery operation.</u> Require fire extinguishers in mobile equipment and at each site location. Allow smoking only in designated areas.</p>	
<p><b>Underground and Overhead Utilities:</b> <u>Underground and/or overhead utilities may be present.</u> Complete utility clearance before subsurface work. Check for underground utilities before excavation. Survey for overhead utilities before bringing equipment with high extensions (heavy equipment, dump trucks) into a work area. Do <u>not</u> operate equipment within 10-feet of overhead lines. Determine and comply with the required distance from energized overhead electric lines per EM 385-1-1 11E and Tables 11-1 and 11-3.</p>	
<p><b>Heavy Equipment Operation:</b> <u>Heavy equipment will be mobilized and inspected before site work.</u> Inspect heavy equipment daily and document. Check operation of backup alarms. Survey area for utilities. Have ground personnel wear high-visibility safety vests with reflective striping. Maintain positive contact between operator and ground personnel at all times. Use hand signals. Do <u>not</u> cross path of moving equipment or cross behind equipment. Position ground personnel out of the swing radius of operating heavy equipment when possible. Do <u>not</u> walk underneath loaded buckets. Require equipment operators to look before backing. Maintain dust control. Place bucket on the ground for equipment shut down.</p>	
<p><b>Vehicle and Equipment Traffic:</b> <u>Concurrent use of vehicles and ground personnel will occur.</u> Establish traffic control procedures when there is vehicle, heavy equipment, and/or pedestrian traffic present. Have workers wear high-visibility safety vests with reflective striping when working near traffic areas. Advise workers to look carefully where they walk to avoid vehicles and moving equipment. Maintain eye contact with heavy equipment operators. Use traffic control devices as needed. Use spotters if needed for backing of equipment and vehicles into tight work areas.</p>	
<p><b>Material Handling:</b> <u>Material handling involving lifting, and carrying will be required.</u> Wear work gloves when handling materials. Watch for items that can cut, puncture, pinch, or crush. Use proper lifting technique. Size up load, get help for heavy or awkward items, get good grasp on object to be lifted, keep load close to body, keep back straight, lift with legs not with back, and do <u>not</u> twist when lifting. Review material handling procedures during safety meetings.</p>	

## ACTIVITY HAZARD ANALYSIS

### ACTIVITY: MOBILIZATION AND SITE PREPARATION

**Tools, Machinery and Equipment Use:** Hand and power tools may be used. Use the proper tool for the job. Use GFCIs for power tool operation. Use safety glasses. Do not use damaged tools. Properly secure materials when working on them. Make sure area is adequately clear when using equipment. Inspect electrical cords.

**Electrical Equipment and Lockout/Tagout:** Generators may be used to provide electrical power. Use GFCIs for portable electrical equipment. Inspect electrical extension cords for damage and ground plugs. Keep electrical equipment/cords away from water and fuel materials. Use lockout/tagout procedures.

**Noise Exposure:** Noise exposure above 85 dBA is expected when working near or operating machinery and equipment. Wear earplugs for protection.

**Heat Stress:** Heat stress may occur when elevated ambient temperatures, moderate to heavy workloads, and/or use of impermeable protective clothing occur. Adjust work-rest schedules. Work at a steady pace. Drink fluids. Take rest breaks and use shaded rest area. Know signs and symptoms of heat stress and treatment. Monitor for heat stress.

**Cold Stress:** Cold stress may occur during the fall/winter/spring months when decreased ambient temperatures are present. Minimize exposure to temperatures below 45°F. Wear insulated clothing for cold temperature work. Know the signs/symptoms of cold exposure and emergency treatment.

**Chain Saw Operation:** Chain saws may be used during clearing and grubbing activities. Use eye, face and hand protection. Use operators trained in the proper operation of the saw. Do not allow saws to be operated with one hand or used at a height above chest level.

**Inclement Weather and Adverse Environmental Conditions:** Inclement weather conditions such as strong winds, heavy rain or lightning, and snow may occur during outdoor operations. Suspend outdoor operations during inclement weather or when other adverse environmental conditions exist.

**Miscellaneous Physical Hazards:** General safety hazards will be present during all site tasks. Use PPE for head, eye, hand, foot, and body protection. Follow safe work practices. Watch for slip, trip, and fall hazards from uneven, wet, slippery ground surfaces. Keep ground areas clear of tripping hazards such as hoses, cords, boxes, and debris. Maintain good housekeeping. Look where walking. Maintain balance. Maintain three-point contact when stepping off equipment. Use short steps when walking on slippery surfaces. Communicate general safety information during safety meetings.

**Site Emergencies:** Preparation for site emergencies is always a requirement for site work. Set-up emergency communications. Prepare emergency supplies. Post emergency contact and hospital route information. Maintain emergency phone list/hospital location/route map on site. Have first-aid kit, fire extinguisher, and safety supplies available. Have cell phones available. Designate evacuation location and emergency signals. See the "Emergency Response Plan" section of SSHP.

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Hand and power tools; Generator; Heavy equipment (mobilization initial inspection); Chain saws; Wood chipper	Safety inspection; Heavy equipment inspection	Site orientation briefing and SSHP review; HazWOPER training; First-aid/CPR training (minimum of two persons on site)

# ACTIVITY HAZARD ANALYSIS

ACTIVITY: SOIL EXCAVATION, TRANSPORTATION AND DISPOSAL	
Prepared By: Glen Mayekawa, CIH / Date: 7-29-05	Reviewed By: William Torres, EIT
WORK TASK	POTENTIAL HAZARDS
<ul style="list-style-type: none"> <li>-Review utility clearance</li> <li>-Delineate excavation areas</li> <li>-Establish haul routes</li> <li>-Implement dust control measures</li> <li>-Excavate contaminated soil from 4 properties</li> <li>-Load contaminated soil into dump trucks</li> <li>-Transport contaminated soil for disposal.</li> </ul>	<p><b>Chemical hazards:</b> Potential exposure to site contaminants during this activity.</p> <p><b>Biological hazards:</b> Potential exposure to poisonous plants, snakes, spiders, rodents, insects, ticks, and mosquitoes.</p> <p><b>Physical Hazards:</b> Potential exposure to physical hazards: Fire protection; underground and overhead utilities; heavy equipment operation; excavation and trench safety; vehicle and equipment traffic; material handling; tools, machinery and equipment use; noise exposure; heat stress; cold stress; inclement weather and adverse environmental conditions; miscellaneous physical hazards. <b>SEE RECOMMENDED HAZARD CONTROLS BELOW.</b></p>
RECOMMENDED HAZARD CONTROLS	
<p><b>Chemical Hazards:</b> <u>Exposure to site contaminants may occur during excavation and loading.</u> Conduct monitoring as described in the "Exposure Monitoring" section of the SSHP. Use prescribed levels of protection described in the PPE section of the SSHP for the applicable work task. Properly don and doff protective clothing. Avoid contact with contaminated surfaces whenever possible. Use prescribed decontamination measures.</p>	
<p><b>Biological Hazards:</b> <u>Biological hazards may be present.</u> Watch for, and avoid contact with, poisonous plants, snakes, spiders, rodents, insects, ticks, and mosquitoes. Wear long-sleeved shirts and pants. Apply repellent containing 20% - 30% DEET if needed.</p>	
<p><b>Fire Protection:</b> <u>Gasoline and diesel fuel will be used for vehicles, heavy equipment, and machinery operation.</u> Require fire extinguishers in mobile equipment and at each site location. Allow smoking only in designated areas.</p>	
<p><b>Underground and Overhead Utilities:</b> <u>Underground and/or overhead utilities may be present.</u> Complete utility clearance before subsurface work. Check for underground utilities before excavation. Survey for overhead utilities before bringing equipment with high extensions (heavy equipment, dump trucks) into a work area. Do <u>not</u> operate equipment within 10-feet of overhead lines. Determine and comply with the required distance from energized overhead electric lines per EM 385-1-1 11E and Tables 11-1 and 11-3.</p>	
<p><b>Heavy Equipment Operation:</b> <u>Heavy equipment will be used to excavate contaminated soil and load into dump trucks.</u> Inspect heavy equipment daily and document. Check operation of backup alarms. Survey area for utilities. Have ground personnel wear high-visibility safety vests with reflective striping. Maintain positive contact between operator and ground personnel at all times. Use hand signals. Do <u>not</u> cross path of moving equipment or cross behind equipment. Position ground personnel out of the swing radius of operating heavy equipment when possible. Do <u>not</u> walk underneath loaded buckets. Require equipment operators to look before backing. Maintain dust control. Place bucket on the ground for equipment shut down.</p>	
<p><b>Excavation and Trench Safety:</b> <u>Certain excavation operations may require personnel entry into trenches or excavations.</u> Complete excavation entry operations according to OSHA requirements if entry into trenches 4 feet or more in depth or excavations 5 feet or more in depth. Check for underground utilities before excavation. Survey for overhead utilities before bringing equipment with high extensions (heavy equipment) into a work area. Do <u>not</u> operate equipment within 10 feet of overhead lines. For excavation entry operations, have a "Competent Person" supervise operations, conduct daily inspections, and implement protective systems for excavation operations (sloping, benching, shielding, and/or shoring) if soils are <u>not</u> sufficiently stable.</p>	
<p><b>Vehicle and Equipment Traffic:</b> <u>Concurrent use of vehicles, heavy equipment and ground personnel will occur.</u> Establish traffic control procedures when there is vehicle, heavy equipment, and/or pedestrian traffic present. Have workers wear high-visibility safety vests with reflective striping when working near traffic areas. Advise workers to look carefully where they walk to avoid vehicles and moving equipment. Maintain eye contact with heavy equipment operators. Use traffic control devices as needed. Use spotters if needed for backing of equipment and vehicles into tight work areas.</p>	

## ACTIVITY HAZARD ANALYSIS

### ACTIVITY: SOIL EXCAVATION, TRANSPORTATION AND DISPOSAL

**Material Handling:** Material handling involving lifting and carrying will be required. Wear work gloves when handling materials. Watch for items that can cut, puncture, pinch, or crush. Use proper lifting technique. Size up load, get help for heavy or awkward items, get good grasp on object to be lifted, keep load close to body, keep back straight, lift with legs not with back, and do not twist when lifting. Review material handling procedures during safety meetings.

**Tools, Machinery and Equipment Use:** Hand and power tools may be used. Use proper tool for the job. Use GFCIs for power tool operation. Use safety glasses. Do not use damaged tools. Properly secure materials when working on them. Make sure area is adequately clear when using equipment. Inspect electrical cords.

**Noise Exposure:** Noise exposure above 85 dBA is expected when working near or operating machinery and equipment. Wear earplugs for protection.

**Heat Stress:** Heat stress may occur when elevated ambient temperatures, moderate to heavy workloads, and/or use of impermeable protective clothing occur. Adjust work-rest schedules. Work at a steady pace. Drink fluids. Take rest breaks and use shaded rest area. Know signs and symptoms of heat stress and treatment. Monitor for heat stress.

**Cold Stress:** Cold stress may occur during the fall/winter/spring months when decreased ambient temperatures are present. Minimize exposure to temperatures below 45°F. Wear insulated clothing for cold temperature work. Know the signs/symptoms of cold exposure and emergency treatment.

**Inclement Weather and Adverse Environmental Conditions:** Inclement weather conditions such as strong winds, heavy rain or lightning, and snow may occur during outdoor operations. Suspend outdoor operations during inclement weather or when other adverse environmental conditions exist.

**Miscellaneous Physical Hazards:** General safety hazards will be present during all site tasks. Use PPE for head, eye, hand, foot, and body protection. Follow safe work practices. Watch for slip, trip, and fall hazards from uneven, wet, slippery ground surfaces. Keep ground areas clear of tripping hazards such as hoses, cords, boxes, and debris. Maintain good housekeeping. Look where walking. Maintain balance. Maintain three-point contact when stepping off equipment. Use short steps when walking on slippery surfaces. Communicate general safety information during safety meetings.

**PPE:** Use prescribed levels of protection described in the PPE section of the SSHP for the applicable work task. Level D protection consists of: Hardhat, steel-toed boots, work gloves, safety glasses, high-visibility safety vest with reflective striping (if vehicle or equipment traffic), and earplugs (if noise present.) Modified Level D protection consists of: Level D protection equipment plus chemical protective clothing (protective suit, gloves, and boots or boot covers.) Level C protection consists of: Modified Level D protection equipment plus an APR (with P-100 HEPA filter cartridge.)

**Site Emergencies:** Preparation for site emergencies is always a requirement for site work. Set-up emergency communications. Prepare emergency supplies. Post emergency contact and hospital route information. Maintain emergency phone list/hospital location/route map on site. Have first-aid kit, fire extinguisher, and safety supplies available. Have cell phones available. Designate evacuation location and emergency signals. See the "Emergency Response Plan" section of SSHP.

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Heavy equipment; Water truck; Dump trucks	Safety inspection; Heavy equipment inspection; Excavation inspection (if entry into excavation)	Site orientation briefing and SSHP review; HazWOPER training; Excavation safety training (for Competent Person); First-aid/CPR training (minimum of two persons on site)

# ACTIVITY HAZARD ANALYSIS

<b>ACTIVITY: SAMPLING AND ANALYSIS</b>	
<b>Prepared By: Glen Mayekawa, CIH / Date: 7-29-05</b>	<b>Reviewed By: William Torres, EIT</b>
<b>WORK TASK</b>	<b>POTENTIAL HAZARDS</b>
<ul style="list-style-type: none"> <li>-Calibrate air monitoring equipment daily</li> <li>-Set-up perimeter air monitoring stations</li> <li>-Collect PCB perimeter air samples during excavation</li> <li>-Collect soil samples from designated Phase B properties</li> <li>-Use field screening kit methods for excavation sampling</li> <li>-Collect/analyze excavation confirmation soil samples</li> <li>-Perform interior dust sampling of homes and commercial buildings designated by the EPA.</li> </ul>	<p><b>Chemical hazards:</b> Potential exposure to site contaminants during this activity.</p> <p><b>Biological hazards:</b> Potential exposure to poisonous plants, snakes, spiders, rodents, insects, ticks, and mosquitoes.</p> <p><b>Physical Hazards:</b> Potential exposure to physical hazards: Fire protection; vehicle and equipment traffic; material handling; tools, machinery, and equipment use; noise exposure; heat stress; cold stress; inclement weather and adverse environmental conditions; miscellaneous physical hazards. <b>SEE RECOMMENDED HAZARD CONTROLS BELOW.</b></p>
<b>RECOMMENDED HAZARD CONTROLS</b>	
<p><b>Chemical Hazards:</b> <u>Minor potential for exposure to contaminants during this activity.</u> Use prescribed PPE (Use Modified Level D or Level D protection for sampling.) Avoid contact with contaminated surfaces whenever possible. Use prescribed decontamination measures.</p>	
<p><b>Biological Hazards:</b> <u>Biological hazards may be present.</u> Watch for, and avoid contact with, poisonous plants, snakes, spiders, rodents, insects, ticks, and mosquitoes. Wear long-sleeved shirts and pants. Apply repellent containing 20% - 30% DEET if needed.</p>	
<p><b>Fire Protection:</b> <u>Gasoline and diesel fuel will be used for vehicles, heavy equipment, and machinery operation.</u> Require fire extinguishers in mobile equipment and at each site location. Allow smoking only in designated areas.</p>	
<p><b>Vehicle and Equipment Traffic:</b> <u>Concurrent use of vehicles, heavy equipment and ground personnel will occur.</u> Establish traffic control procedures when there is vehicle, heavy equipment, and/or pedestrian traffic present. Have workers wear high-visibility safety vests with reflective striping when working near traffic areas. Advise workers to look carefully where they walk to avoid vehicles and moving equipment. Maintain eye contact with heavy equipment operators. Use traffic control devices as needed. Use spotters if needed for backing of equipment and vehicles into tight work areas.</p>	
<p><b>Material Handling:</b> <u>Material handling involving lifting and carrying will be required.</u> Wear work gloves when handling materials. Watch for items that can cut, puncture, pinch, or crush. Use proper lifting technique. Size up load, get help for heavy or awkward items, get good grasp on object to be lifted, keep load close to body, keep back straight, lift with legs <u>not</u> with back, and do <u>not</u> twist when lifting. Review material handling procedures during safety meetings.</p>	
<p><b>Tools, Machinery and Equipment Use:</b> <u>Hand and power tools may be used.</u> Use proper tool for the job. Use GFCIs for power tool operation. Use safety glasses. Do <u>not</u> use damaged tools. Properly secure materials when working on them. Make sure area is adequately clear when using equipment. Inspect electrical cords.</p>	
<p><b>Noise Exposure:</b> <u>Noise exposure above 85 dBA is expected when working near or operating machinery and equipment.</u> Wear earplugs for protection.</p>	
<p><b>Heat Stress:</b> <u>Heat stress may occur when elevated ambient temperatures, moderate to heavy workloads, and/or use of impermeable protective clothing occur.</u> Adjust work-rest schedules. Work at a steady pace. Drink fluids. Take rest breaks and use shaded rest area. Know signs and symptoms of heat stress and treatment. Monitor for heat stress.</p>	
<p><b>Cold Stress:</b> <u>Cold stress may occur during the fall/winter/spring months when decreased ambient temperatures are present.</u> Minimize exposure to temperatures below 45°F. Wear insulated clothing for cold temperature work. Know the signs/symptoms of cold exposure and emergency treatment.</p>	
<p><b>Inclement Weather and Adverse Environmental Conditions:</b> <u>Inclement weather conditions such as strong winds, heavy rain or lightning, and snow may occur during outdoor operations.</u> Suspend outdoor operations during inclement weather or when other adverse environmental conditions exist.</p>	

## ACTIVITY HAZARD ANALYSIS

### ACTIVITY: SAMPLING AND ANALYSIS

**Miscellaneous Physical Hazards:** General safety hazards will be present during all site tasks. Use PPE for head, eye, hand, foot, and body protection. Follow safe work practices. Watch for slip, trip, and fall hazards from uneven, wet, slippery ground surfaces. Keep ground areas clear of tripping hazards such as hoses, cords, boxes, and debris. Maintain good housekeeping. Look where walking. Maintain balance. Maintain three-point contact when stepping off equipment. Use short steps when walking on slippery surfaces. Communicate general safety information during safety meetings.

**PPE:** Use prescribed levels of protection described in the PPE section of the SSHP for the applicable work task. Level D protection consists of: Hardhat, steel-toed boots, work gloves, safety glasses, high-visibility safety vest with reflective striping (if vehicle or equipment traffic), and earplugs (if noise present.) Modified Level D protection consists of: Level D protection equipment plus chemical protective clothing (protective suit, gloves, and boots or boot covers.) Level C protection consists of: Modified Level D protection equipment plus an APR (with P-100 HEPA filter cartridge.)

**Site Emergencies:** Preparation for site emergencies is always a requirement for site work. Set-up emergency communications. Prepare emergency supplies. Post emergency contact and hospital route information. Maintain emergency phone list/hospital location/route map on site. Have first-aid kit, fire extinguisher, and safety supplies available. Have cell phones available. Designate evacuation location and emergency signals. See the "Emergency Response Plan" section of SSHP.

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Sampling tools and supplies; Hand auger; Air monitoring equipment; Dust sampling equipment	Safety inspection	Site orientation briefing and SSHP review; HazWOPER training; First-aid/CPR training (minimum of two persons on site)

# ACTIVITY HAZARD ANALYSIS

ACTIVITY: SITE RESTORATION AND DEMOBILIZATION	
Prepared By: Glen Mayekawa, CIH / Date: 7-29-05	Reviewed By: William Torres, EIT
WORK TASK	POTENTIAL HAZARDS
<ul style="list-style-type: none"> <li>-Backfill excavations with clean fill and topsoil</li> <li>-Grade and compact soil</li> <li>-Place sod</li> <li>-Install trees and shrub plantings</li> <li>-Replace or rebuild structures (i.e., fences) removed</li> <li>-Decontaminate equipment</li> <li>-Demobilize personnel and equipment.</li> </ul>	<p><b>Chemical hazards:</b> No anticipated exposure to site contaminants during site restoration activities. Potential exposure to site contaminants during equipment decontamination.</p> <p><b>Biological hazards:</b> Potential exposure to poisonous plants, snakes, spiders, rodents, insects, ticks, and mosquitoes.</p> <p><b>Physical Hazards:</b> Potential exposure to physical hazards: Fire protection; underground and overhead utilities; heavy equipment operation; vehicle and equipment traffic; material handling; tools, machinery, and equipment use; electrical equipment and lockout/tagout; noise exposure; heat stress; cold stress; pressure washer operation; inclement weather and adverse environmental conditions; miscellaneous physical hazards. <b>SEE RECOMMENDED HAZARD CONTROLS BELOW.</b></p>
RECOMMENDED HAZARD CONTROLS	
<p><b>Chemical Hazards:</b> <u>Site contaminants may be present during equipment decontamination.</u> Use prescribed levels of protection described in the PPE section of the SSHP. Properly don and doff protective clothing. Avoid contact with contaminated surfaces when possible. Use prescribed decontamination measures.</p>	
<p><b>Biological Hazards:</b> <u>Biological hazards may be present.</u> Watch for, and avoid contact with, poisonous plants, snakes, spiders, rodents, insects, ticks, and mosquitoes. Wear long-sleeved shirts and pants. Apply repellent containing 20% - 30% DEET if needed.</p>	
<p><b>Fire Protection:</b> <u>Gasoline and diesel fuel will be used for vehicles, heavy equipment, and machinery operation.</u> Require fire extinguishers in mobile equipment and at each site location. Allow smoking only in designated areas.</p>	
<p><b>Underground and Overhead Utilities:</b> <u>Underground and/or overhead utilities may be present.</u> Complete utility clearance before subsurface work. Check for underground utilities before excavation. Survey for overhead utilities before bringing equipment with high extensions (heavy equipment, dump truck) into a work area. Do <u>not</u> operate equipment within 10-feet of overhead lines. Determine and comply with the required distance from energized overhead electric lines per EM 385-1-1 11E and Tables 11-1 and 11-3.</p>	
<p><b>Heavy Equipment Operation:</b> <u>Heavy equipment will be used to backfill and compact soil and perform other earthmoving tasks.</u> Inspect heavy equipment daily and document. Check operation of backup alarms. Survey area for utilities. Have ground personnel wear high-visibility safety vests with reflective striping. Maintain positive contact between operator and ground personnel at all times. Use hand signals. Do <u>not</u> cross path of moving equipment or cross behind equipment. Position ground personnel out of the swing radius of operating heavy equipment when possible. Do <u>not</u> walk underneath loaded buckets. Require equipment operators to look before backing. Maintain dust control. Place bucket on the ground for equipment shut down.</p>	
<p><b>Vehicle and Equipment Traffic:</b> <u>Concurrent use of vehicles and ground personnel will occur.</u> Establish traffic control procedures when there is vehicle, heavy equipment, and/or pedestrian traffic present. Have workers wear high-visibility safety vests with reflective striping when working near traffic areas. Advise workers to look carefully where they walk to avoid vehicles and moving equipment. Maintain eye contact with heavy equipment operators. Use traffic control devices as needed. Use spotters if needed for backing of equipment and vehicles into tight work areas.</p>	
<p><b>Material Handling:</b> <u>Material handling involving lifting, and carrying will be required.</u> Wear work gloves when handling materials. Watch for items that can cut, puncture, pinch, or crush. Use proper lifting technique. Size up load, get help for heavy or awkward items, get good grasp on object to be lifted, keep load close to body, keep back straight, lift with legs not with back, and do <u>not</u> twist when lifting. Review material handling procedures during safety meetings.</p>	
<p><b>Tools, Machinery and Equipment Use:</b> <u>Hand and power tools may be used.</u> Use the proper tool for the job. Use GFCIs for power tool operation. Use safety glasses. Do <u>not</u> use damaged tools. Properly secure materials when working on them. Make sure area is adequately clear when using equipment. Inspect electrical cords.</p>	
<p><b>Electrical Equipment and Lockout/Tagout:</b> <u>Generators may be used to provide electrical power.</u> Use GFCIs for portable electrical equipment. Inspect electrical extension cords for damage and ground plugs. Keep electrical equipment/cords away from water and fuel materials. Use-lockout/tagout procedures.</p>	

## ACTIVITY HAZARD ANALYSIS

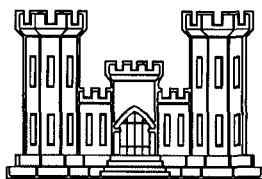
<b>ACTIVITY: SITE RESTORATION AND DEMOBILIZATION</b>		
<b>Noise Exposure:</b> Noise exposure above 85 dBA is expected when working near or operating machinery and equipment. Wear earplugs for protection.		
<b>Heat Stress:</b> Heat stress may occur when elevated ambient temperatures, moderate to heavy workloads, and/or use of impermeable protective clothing occur. Adjust work-rest schedules. Work at a steady pace. Drink fluids. Take rest breaks and use shaded rest area. Know signs and symptoms of heat stress and treatment. Monitor for heat stress.		
<b>Cold Stress:</b> Cold stress may occur during the fall/winter/spring months when decreased ambient temperatures are present. Minimize exposure to temperatures below 45°F. Wear insulated clothing for cold temperature work. Know the signs/symptoms of cold exposure and emergency treatment.		
<b>Pressure Washer Operation:</b> Pressure washer equipment may be used for equipment cleaning. Use gloves, face, and eye protection during pressure washer operation. Keep area clear when washing. Do <u>not</u> clean boots with pressure washer. Watch for slippery surfaces and handling of slippery materials. Have fire extinguisher and emergency eyewash supplies immediately available.		
<b>Inclement Weather and Adverse Environmental Conditions:</b> Inclement weather conditions such as strong winds, heavy rain or lightning, and snow may occur during outdoor operations. Suspend outdoor operations during inclement weather or when other adverse environmental conditions exist.		
<b>Miscellaneous Physical Hazards:</b> General safety hazards will be present during all site tasks. Use PPE for head, eye, hand, foot, and body protection. Follow safe work practices. Watch for slip, trip, and fall hazards from uneven, wet, slippery ground surfaces. Keep ground areas clear of tripping hazards such as hoses, cords, boxes, and debris. Maintain good housekeeping. Look where walking. Maintain balance. Maintain three-point contact when stepping off equipment. Use short steps when walking on slippery surfaces. Communicate general safety information during safety meetings.		
<b>PPE:</b> Use prescribed levels of protection described in the PPE section of the SSHP for the applicable work task. Level D protection consists of: Hardhat, steel-toed boots, work gloves, safety glasses, high-visibility safety vest with reflective striping (if vehicle or equipment traffic), and earplugs (if noise present.) Modified Level D protection consists of: Level D protection equipment plus chemical protective clothing (protective suit, gloves, and boots or boot covers.) Level C protection consists of: Modified Level D protection equipment plus an APR (with P-100 HEPA filter cartridge.)		
<b>Site Emergencies:</b> Preparation for site emergencies is always a requirement for site work. Set-up emergency communications. Prepare emergency supplies. Post emergency contact and hospital route information. Maintain emergency phone list/hospital location/route map on site. Have first-aid kit, fire extinguisher, and safety supplies available. Have cell phones available. Designate evacuation location and emergency signals. See the "Emergency Response Plan" section of SSHP.		
EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Heavy equipment; Compactor; Water truck; Pressure washer; Generator	Safety inspection; Heavy equipment inspection; Equipment decontamination release authorization	Site orientation briefing and SSHP review; HazWOPER training; First-aid/CPR training (minimum of two persons on site)

**ATTACHMENT 4**  
**COMMUNITY AMBIENT AIR MONITORING PLAN**

**COMMUNITY AMBIENT AIR MONITORING PLAN**  
**REMEDIAL DESIGN**  
**FINAL**  
**OPERABLE UNIT 1**  
**CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE**  
**SOUTH PLAINFIELD, NEW JERSEY**

**Contract Number W912DQ-05-D-0001**  
**Task Order Number 001**

*Prepared for:*



**U.S. ARMY CORPS OF ENGINEERS**  
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**CAPE Project Number 50001.001**  
**October 2005**

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  - ▲ EPA Method TO-10A

## LIST OF ABBREVIATIONS AND ACRONYMS

AIHA	American Industrial Hygiene Association
CAAMP	Community Ambient Air Monitoring Plan
CDE	Cornell-Dublier Electronics
CIH	Certified Industrial Hygienist
COR	Contracting Officer's Representative
ECD	Electron Capture Detector
EPA	U.S. Environmental Protection Agency
FPD	Flame Photometric Detector
GC	Gas Chromatograph
GC/ECD	Gas Chromatography/Electron Capture Detector
GC/MD	Gas Chromatography/Multi-Detection
HECD	Hall Electrolytic Conductivity Detector
LPM	Liter per Minute
µg	Microgram
µg/m <sup>3</sup>	Micrograms per Cubic Meter
mg	Milligram
mg/kg	Milligrams per Kilogram
mg/m <sup>3</sup>	Milligrams Per Cubic Meter
mm	Millimeter
MS	Mass Spectrometer
NAAQS	National Ambient Air Quality Standard
NPD	Nitrogen-Phosphorus Detector
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PCB	Polychlorinated Biphenyl
PEL	Permissible Exposure Limit
PM	Project Manager
PUF	Polyurethane Foam
ROD	Record of Decision
scfm	Standard Cubic Feet per Minute
SHM	Safety and Health Manager
SOW	Statement of Work
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
STEL	Short-Term Exposure Limit
TLV	ACGIH Threshold Limit Value
TWA	Time-Weighted Average
USACE	U.S. Army Corps of Engineers

## 1.0 BACKGROUND

This Community Ambient Air Monitoring Plan (CAAMP) presents air monitoring procedures to be implemented by CAPE while performing services for the U.S. Army Corps of Engineers (USACE), Kansas City District at the Cornell-Dublier Electronics (CDE) Superfund Site Operable Unit (OU)-1 Phase A Remedial Action, South Plainfield, New Jersey project site.

The purpose of the CAAMP is to provide community air monitoring procedures to be conducted by CAPE during soil excavation activities. This CAAMP has been prepared to meet the requirements of the Department of the Army, Kansas City District, Corps of Engineers, Statement of Work (SOW) dated 8 March 2005.

The CAPE Project Manager (PM), Site Safety and Health Officer (SSHO), and Safety and Health Manager (SHM) will implement the CAAMP in coordination with the USACE Contracting Officer's Representative (COR) and U.S. Environmental Protection Agency (EPA) Point of Contact (POC.) Project personnel performing in these functions are indicated on the Emergency Contact List of the project Site Safety and Health Plan (SSHP.)

### 1.1 Site Location and Background

The CDE site is located at 333 Hamilton Boulevard, South Plainfield, Middlesex County, New Jersey. The former CDE facility, now known as the Hamilton Industrial Park, consists of approximately 26 acres containing 18 buildings that are currently used by a variety of commercial and industrial tenants. The CDE site is on the National Priorities List due to polychlorinated biphenyl (PCB) contamination found in soil and buildings.

CDE began leasing the subject property in 1936. CDE operated in South Plainfield from 1936 to 1962. CDE manufactured electronics components including, in particular, capacitors. PCBs and chlorinated organic solvents were used in the manufacturing process. CDE's activities evidently led to widespread chemical contamination at the facility and migration of contaminants to areas adjacent to the facility. PCBs have been detected in the groundwater, soils, and in building interiors at the industrial park; at adjacent residential, commercial, and municipal properties; and in the surface water and sediments of the Bound Brook. Since CDE's departure from the facility in 1962, it has been operated as a rental property, with over 100 commercial and industrial companies operating at the facility as tenants.

The EPA has divided the Site into separate phases, or operable units, for remediation purposes. OU-1 consists of residential, commercial, and municipal properties located in the vicinity of the former CDE facility. OU-2 addresses the former CDE facility, consisting of contaminated facility soils and buildings at the former CDE facility, including soils that may act as a source of groundwater contamination.

This project task order focuses on OU-1 PCB-contaminated soils and properties in the vicinity of the former CDE facility.

### 1.2 Scope of Work

The scope of this project involves the excavation; transportation and disposal; sampling and analysis; and site restoration activities associated with the excavation of approximately 750 cubic yards of PCB-contaminated soil from four vicinity properties designated as OU-1, Phase A.

Properties designated as OU-1, Phase A include:

- ▲ *Addresses redacted*
- ▲
- ▲
- ▲

### 1.3 Community Ambient Air Monitoring Activities

According to the project SOW, PCB air sampling shall be performed using perimeter air monitoring equipment during excavation of contaminated soil at each property. Air monitoring shall be performed to

ensure compliance with action levels established in the Record of Decision (ROD) for interior dust. The number and locations of the air monitoring stations shall be sufficient to provide adequate protection to workers, neighboring properties, and the public at large. Air monitoring equipment shall be maintained and calibrated according to EPA analytical methods and manufacturer's recommendations. Maintenance and calibration data shall be recorded and included in project documents.

## 2.0 COMMUNITY AMBIENT AIR MONITORING

A description of community ambient air monitoring to be performed by CAPE during the project is provided in this section of the CAAMP. Community ambient air monitoring will be conducted for airborne dust and PCBs during the project. CAAMP information is reviewed below and action levels are summarized in Table 1.

Community ambient air monitoring is conducted by the SSHO or qualified designee. If action level concentrations are exceeded, then response actions are initiated to: notify the SSHO; increase implementation of engineering controls (i.e., water application for dust control) and safe work practices; and to stop work until the situation is evaluated and remedied. Monitoring program data is recorded by the SSHO. The SSHO is responsible for maintaining monitoring records at the site for the duration of the project.

### 2.1 Real-Time Airborne Dust Monitoring

Real time community ambient airborne dust monitoring will be conducted during PCB-contaminated soil excavation. A PCB-equivalent airborne dust action level will be calculated. Airborne dust concentrations exceeding the action level will trigger use of additional dust control measures.

#### 2.1.1 PCB-Equivalent Airborne Dust Action Level

The PCB-equivalent airborne dust action level represents the predicted maximum PCB-containing airborne dust concentrations that could be encountered. Airborne dust action levels are based on the cumulative total of the highest soil sample concentrations of PCB obtained during site assessment soil sampling. The action level is calculated using the following formula:

$$\text{Elmix} = \frac{(\text{EL mg/m}^3)}{(\text{Conc. mg/kg}) \times (\text{SF})} = \frac{(10^6 \text{ mg/kg}) \times (\text{EL mg/m}^3)}{(\text{Conc. mg/kg}) \times (\text{SF})}$$

#### Where:

- Elmix: Airborne dust concentration where non-volatile contaminants would be at their Occupational Safety and Health Administration (OSHA) eight-hour time-weighted average (TWA) permissible exposure limit (PEL) or American Conference of Industrial Hygienists (ACGIH) threshold limit value (TLV.) Note: For this project, a value of one hundredth of the TLV will be used.
- EL: Exposure limit (typically lowest of PEL or TLV) of specific non-volatile soil contaminant in milligrams per cubic meter ( $\text{mg/m}^3$ ). Note: For this project, a value of one hundredth of the TLV will be used.
- $10^6$ : Conversion factor
- Conc.: Estimated maximum specific contaminant soil concentration in milligrams per kilogram ( $\text{mg/kg}$ )
- SF: Safety factor (1 to 10 times depending upon confidence with soil sampling data)

#### PCB-Equivalent Airborne Dust Action Level Calculation:

PCB was found in the soil at a maximum concentration of 321  $\text{mg/kg}$  (at the 321 Spicer Avenue property.) One hundredth of the 8-hour TWA TLV for PCB (54 percent chlorine) is  $0.005 \text{ mg/m}^3$ . A safety factor of 2 is used. The PCB-equivalent airborne dust action level calculation is shown below:

$$\text{ELmix} = \frac{(10^6 \text{ mg/kg}) \times (0.005 \text{ mg/m}^3)}{(321 \text{ mg/kg}) \times (2)} = 7.8 \text{ mg/m}^3$$

Based on this calculation, the amount of PCB-contaminated airborne dust present would have to be at a relatively high concentration before a potential exposure could occur. In addition to the 7.8 mg/m<sup>3</sup> 8-hour TWA action level, a 15-minute short-term exposure limit (STEL) action level of 10 mg/m<sup>3</sup> will be used to provide for quick response to elevated airborne dust levels should they occur.

### 2.1.2 Real-Time Airborne Dust Action Level:

Ambient airborne dust concentrations during PCB-contaminated soil excavation exceed 7.79 mg/m<sup>3</sup> (8-hour TWA) or 10 mg/m<sup>3</sup> (15-minute STEL.) **ACTION:** Stop work. Increase dust control measures. Contact the SSHO to evaluate.

### 2.1.3 Real-Time Airborne Dust Monitoring Method

A Thermo MIE PdR-1000 Personal DataRAM aerosol monitor will be used to conduct continuous ambient airborne dust monitoring during PCB-contaminated soil excavation.

This direct-reading dust monitor is capable of measuring dust with a particle size of 0.1 to 10 µm over a range of 0.001 to 400 mg/m<sup>3</sup>. A Z-pouch unit will be used for zeroing the instrument in accordance with manufacturer instructions. Airborne dust measurements will be collected daily prior to excavation to determine background concentrations.

## 2.2 24-Hour PM<sub>10</sub> Particulate Monitoring

Twenty-four hour monitoring for PM<sub>10</sub> particulates (particles of 10 micrometer size or less) will be conducted during one 24-hour sampling event while PCB-contaminated soil excavation is being conducted at the project. The EPA National Ambient Air Quality Standard (NAAQS) concentration for particulate matter (PM<sub>10</sub> 24-hour standard) of 150 micrograms per cubic meter (µg/m<sup>3</sup>) will be applied.

### 2.2.1 24-Hour PM<sub>10</sub> Particulate Monitoring Action Level:

24-hour ambient particulate concentrations during PCB-contaminated soil excavation exceed 150 µg/m<sup>3</sup>.) **ACTION:** Stop work. Increase dust control measures. Contact the SSHO to evaluate.

### 2.2.2 24-Hour PM<sub>10</sub> Particulate Monitoring Method

Use an reference or equivalent method cited in the EPA National Exposure Research Laboratory, Human Exposure and Atmospheric Sciences Division, List of Designated Reference and Equivalent Methods ([www.epa.gov/ttn/amtic/criteria.html](http://www.epa.gov/ttn/amtic/criteria.html)) for Particulate Matter – PM<sub>10</sub>.

## 2.3 24-Hour PCB Monitoring

Twenty-four hour monitoring for PCBs will be conducted during one 24-hour sampling event while PCB-contaminated soil excavation is being conducted at the project. A community airborne contaminant exposure standard for PCBs does not currently exist. A conservative airborne contaminant concentration of one hundredth of the PCB eight-hour TWA TLV (0.005 mg/m<sup>3</sup>) will be used as a PCB community ambient air monitoring response action level. The use of an action level of one hundredth of the occupational exposure limit has previously been applied on other EPA Region 2 projects (Federal Creosote, CIC.)

### 2.3.1 PCB Air Monitoring Action Level:

PCB air concentrations are greater than, or equal to, 0.005 mg/m<sup>3</sup> (one-hundredth of the eight-hour TWA TLV for PCBs.) **ACTION:** Stop work. Increase dust control measures. Contact the SSHO to evaluate.

### 2.3.2 PCB Air Monitoring Method

Either the EPA Compendium Method TO-4A (Determination of Pesticides and PCBs in Ambient Air Using High Volume Polyurethane Foam [PUF] Sampling Followed by Gas Chromatographic/Multi-Detection [GC/MD], January 1999) or the EPA Compendium Method TO-10A (Determination of Pesticides and PCBs in Ambient Air Using Low Volume PUF Sampling Followed by GC/MD, January 1999) will be used for PCB air monitoring.

EPA Method TO-4A PCB air sampling involves the use of a high-volume sampler to collect PCBs on a sorbent cartridge containing PUF. The sample is operated for 24-hours after which the sorbent is submitted to a laboratory for analysis. At the laboratory, PCBs are extracted from the sorbent cartridge with 10 percent diethyl ether in hexane and analyzed by gas chromatograph (GC) coupled with an electron capture detector (ECD), nitrogen-phosphorus detector (NPD), flame photometric detector (FPD), Hall electrolytic conductivity detector (HECD), or a mass spectrometer (MS.) The high-volume sampler must be capable of pulling ambient air through the filter/adsorbent cartridge at a flow rate of approximately 8 scfm (0.225 standard cubic meters per minute) to obtain a total sample volume of greater than 300 standard cubic meters over a 24-hour period. A high-volume sampler calibrator capable of providing multipoint resistance for the high volume sampler is used for calibration.

EPA Method TO-10A PCB air sampling involves use of personal air sampling pumps to draw air through 76-millimeter (mm) PUF tubes (SKC #226-92). Air samples are collected at a flow rate of 1 to 5 liters per minute (LPM.) Air samples are analyzed at an approved laboratory by gas chromatography/electron capture detection (GC/ECD) according to EPA Method TO-10A. Personal air sampling pumps will be calibrated before and after use (pre-/post-calibration) with a rotameter, electronic bubble meter calibrator, or equivalent. The average of the pre- and post-calibration will be used as a measure of the "true" sample flow rate.

## TABLES

**TABLE 1**  
**COMMUNITY AMBIENT AIR MONITORING ACTION LEVELS**

Exposure Element	Method	Tasks	Frequency <sup>1</sup>	Action Levels <sup>2</sup>	Action Required
Real-Time Airborne Dust Air Monitoring	Thermo MIE PdR-1000 Personal Data RAM aerosol monitor	Excavation of PCB-contaminated soil at each targeted property	Continuous direct-reading instrument monitoring during excavation of PCB-contaminated soil	Greater than 0.15 mg/m <sup>3</sup> (NAAQS concentration for PM <sub>10</sub> particulate matter)	Stop work. Increase dust control measures. Contact the SSHO to evaluate.
PM10 Particulate 24-Hour Air Monitoring	High-volume air sampler, filter, and lab analysis by EPA Reference Method	During excavation of PCB-contaminated soil at one targeted property location during the project	For one 24-hour period during the excavation of PCB-contaminated soil	Greater than 0.15 mg/m <sup>3</sup> (NAAQS concentration for PM <sub>10</sub> particulate matter)	Stop work. Increase dust control measures. Contact the SSHO to evaluate.
PCB 24-Hour Air Monitoring	High-volume air sampler, Filter/PUF cartridge, and lab analysis by EPA Method TO-4A	During excavation of PCB-contaminated soil at one targeted property location during the project	For one 24-hour period during the excavation of PCB-contaminated soil	Greater than 0.005 mg/m <sup>3</sup> (one-hundredth of PCB TLV-TWA)	Stop work. Increase dust control measures. Contact the SSHO to evaluate.
PCB 24-Hour Air Monitoring	Personal air sampling pump, 76-mm PUF tube, and lab analysis by EPA Method TO-10A	During excavation of PCB-contaminated soil at one targeted property location during the project	For one 24-hour period during the excavation of PCB-contaminated soil	Greater than 0.005 mg/m <sup>3</sup> (one-hundredth of PCB TLV-TWA)	Stop work. Increase dust control measures. Contact the SSHO to evaluate.

**LEGEND:**

- 1: Frequency listed is for active contaminated soil excavation periods  
2: Concentrations above background  
PCB: Polychlorinated biphenyl  
PUF: Polyurethane foam  
EPA: U.S. Environmental Protection Agency  
mm: Millimeter  
mg/m<sup>3</sup>: Milligrams per cubic meter  
NAAQS: EPA National Ambient Air Quality Standard  
TLV-TWA: American Conference of Governmental Industrial Hygienists (ACGIH) 8-hour time-weighted average (TWA) Threshold Limit Value.

**APPENDIX 1**

**EPA METHOD TO-4A  
EPA METHOD TO-10A**

**Compendium of Methods  
for the Determination of  
Toxic Organic Compounds  
in Ambient Air**

**Second Edition**

**Compendium Method TO-4A**

**Determination of Pesticides and  
Polychlorinated Biphenyls in Ambient  
Air Using High Volume Polyurethane  
Foam (PUF) Sampling Followed by  
Gas Chromatographic/Multi-Detector  
Detection (GC/MD)**

**Center for Environmental Research Information  
Office of Research and Development  
U.S. Environmental Protection Agency  
Cincinnati, OH 45268**

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## Method TO-4A

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Method TO-4 was originally published in April of 1984 as one of a series of peer reviewed methods in "*Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*," EPA 600/4-89-018. In an effort to keep these methods consistent with current technology, Method TO-4 has been revised and updated as Method TO-4A in this Compendium to incorporate new or improved sampling and analytical technologies. In addition, this method incorporates ASTM Method D 4861-94, *Standard Practice for Sampling and Analysis of Pesticides and Polychlorinated Biphenyls in Air*.

This Method is the result of the efforts of many individuals. Gratitude goes to each person involved in the preparation and review of this methodology.

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#### DISCLAIMER

***This Compendium has been subjected to the Agency's peer and administrative review, and it has been approved for publication as an EPA document. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.***

## METHOD TO-4A

### Determination of Pesticides and Polychlorinated Biphenyls in Ambient Air Using High Volume Polyurethane Foam (PUF) Sampling Followed by Gas Chromatographic/Multi-Detector Detection (GC/MD)

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## METHOD TO-4A

### Determination of Pesticides and Polychlorinated Biphenyls in Ambient Air Using High Volume Polyurethane Foam (PUF) Sampling Followed by Gas Chromatographic/Multi-Detector Detection (GC/MD)

#### 1. Scope

1.1 This document describes a method for sampling and analysis of a variety of common pesticides and for polychlorinated biphenyls (PCBs) in ambient air. The procedure is based on the adsorption of chemicals from ambient air on polyurethane foam (PUF) using a high volume sampler.

1.2 The high volume PUF sampling procedure is applicable to multicomponent atmospheres containing common pesticide concentrations from 0.001 to 50  $\mu\text{g}/\text{m}^3$  over 4- to 24-hour sampling periods. The limits of detection will depend on the nature of the analyte and the length of the sampling period.

1.3 Specific compounds for which the method has been employed are listed in Table 1. The analytical methodology described in Compendium Method TO-4A is currently employed by laboratories throughout the U.S. The sampling methodology has been formulated to meet the needs of common pesticide and PCB sampling in ambient air.

1.4 Compendium Method TO-4 was originally published in 1989 (1). Further updates of the sampling protocol were published as part of Compendium Method TO-13 (2). The method was further modified for indoor air application in 1990 (3). In an effort to keep the method consistent with current technology, Compendium Method TO-4 has incorporated the sampling and analytical procedures in ASTM Method D4861-94 (4) and is published here as Compendium Method TO-4A.

#### 2. Summary of Method

2.1 A high-volume (~8 cfm) sampler is used to collect common pesticides and PCBs on a sorbent cartridge containing PUF. Airborne particles may also be collected, but the sampling efficiency is not known (5). The sampler is operated for 24-hours, after which the sorbent is returned to the laboratory for analysis.

2.2 Pesticides and PCBs are extracted from the sorbent cartridge with 10 percent diethyl ether in hexane and determined by gas chromatography coupled with an electron capture detector (ECD), nitrogen-phosphorus detector (NPD), flame photometric detector (FPD), Hall electrolytic conductivity detector (HECD), or a mass spectrometer (MS). For common pesticides, high performance liquid chromatography (HPLC) coupled with an ultraviolet (UV) detector or electrochemical detector may be preferable.

2.3 Interferences resulting from analytes having similar retention times during GC analysis are resolved by improving the resolution or separation, such as by changing the chromatographic column or operating parameters, or by fractionating the sample by column chromatography.

### 3. Significance

3.1 Pesticide usage and environmental distribution are common to rural and urban areas of the United States. The application of pesticides can cause adverse health effects to humans by contaminating soil, water, air, plants, and animal life. PCBs are less widely used, due to extensive restrictions placed on their manufacturer. However, human exposure to PCBs continues to be a problem because of their presence in various electrical products.

3.2 Many pesticides and PCBs exhibit bioaccumulative, chronic health effects; therefore, monitoring the presence of these compounds in ambient air is of great importance.

3.3 The relatively low levels of such compounds in the environment requires the use of high volume sampling techniques to acquire sufficient sample for analysis. However, the volatility of these compounds prevents efficient collection on filter media. Consequently, Compendium Method TO-4A utilizes both a filter and a PUF backup cartridge which provides for efficient collection of most common pesticides, PCBs, and many other organics within the same volatility range.

3.4 Moreover, modifications to this method has been successfully applied to measurement of common pesticides and PCBs in outdoor air (6), indoor air (3) and for personal respiratory exposure monitoring (3).

### 4. Applicable Documents

#### 4.1 ASTM Standards

- D1356 *Definition of Terms Relating to Atmospheric Sampling and Analysis*
- D4861-94 *Standard Practice for Sampling and Analysis of Pesticides and Polychlorinated Biphenyls in Air*
- E260 *Recommended Practice for General Gas Chromatography Procedures*
- E355 *Practice for Gas Chromatography Terms and Relationships*
- D3686 *Practice for Sampling Atmospheres to Collect Organic Compound Vapors (Activated Charcoal Tube Adsorption Method)*
- D3687 *Practice for Analysis of Organic Compound Vapors Collected by the Activated Charcoal Tube Adsorption*
- D4185 *Practice for Measurement of Metals in Workplace Atmosphere by Atomic Absorption Spectrophotometry*

#### 4.2 EPA Documents

- *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air: Method TO-10, Second Supplement*, U. S. Environmental Protection Agency, EPA 600/4-89-018, March 1989.
- *Manual of Analytical Methods for Determination of Pesticides in Humans and Environmental Standards*, U. S. Environmental Protection Agency, EPA 600/8-80-038, June 1980.
- *Compendium of Methods for the Determination of Air Pollutants in Indoor Air: Method IP-8*, U. S. Environmental Protection Agency, EPA 600/4-90-010, May 1990.

### 4.3 Other Documents

- Code of Federal Regulations, Title 40, Part 136, Method 604

### 5. Definitions

*[Note: Definitions used in this document and in any user-prepared Standard operating procedures (SOPs) should be consistent with ASTM D1356, E260, and E355. All abbreviations and symbols are defined within this document at point of use.]*

**5.1 Sampling efficiency (SE)**-ability of the sampling medium to trap analytes of interest. The percentage of the analyte of interest collected and retained by the sampling medium when it is introduced as a vapor in air or nitrogen into the air sampler and the sampler is operated under normal conditions for a period of time equal to or greater than that required for the intended use is indicated by %SE.

**5.2 Retention efficiency (RE)**-ability of sampling medium to retain a compound added (spiked) to it in liquid solution.

**5.3 Retention time (RT)**-time to elute a specific chemical from a chromatographic column, for a specific carrier gas flow rate, measured from the time the chemical is injected into the gas stream until it appears at the detector.

**5.4 Relative retention time (RRT)**-a ratio of RTs for two chemicals for the same chromatographic column and carrier gas flow rate, where the denominator represents a reference chemical.

**5.5 Method detection limit (MDL)**-the minimum concentration of a substance that can be measured and reported with confidence and that the value is above zero.

**5.6 Kuderna-Danish apparatus**-the Kuderna-Danish (K-D) apparatus is a system for concentrating materials dissolved in volatile solvents.

**5.7 MS-SIM**-the GC is coupled to a mass spectrometer where the instrument is programmed to acquire data for only the target compounds and to disregard all others, thus operating in the select ion monitoring mode (SIM). This is performed using SIM coupled to retention time discriminators. The SIM analysis procedure provides quantitative results.

**5.8 Sublimation**-the direct passage of a substance from the solid state to the gaseous state and back into the solid form without any time appearing in the liquid state. Also applied to the conversion of solid to vapor without the later return to solid state, and to a conversion directly from the vapor phase to the solid state.

**5.9 Surrogate standard**-a chemically compound (not expected to occur in the environmental sample) which is added to each sample, blank and matrix spiked sample before extraction and analysis. The recovery of the surrogate standard is used to monitor unusual matrix effects, gross sample processing errors, etc. Surrogate recovery is evaluated for acceptance by determining whether the measured concentration falls within acceptable limits.

## 6. Interferences

6.1 Any gas or liquid chromatographic separation of complex mixtures of organic chemicals is subject to serious interference problems due to coelution of two or more compounds. The use of capillary or microbore columns with superior resolution or two or more columns of different polarity will frequently eliminate these problems. In addition, selectivity may be further enhanced by use of a MS operated in the selected ion monitoring (SIM) mode as the GC detector. In this mode, co-eluting compounds can often be determined.

6.2 The ECD responds to a wide variety of organic compounds. It is likely that such compounds will be encountered as interferences during GC/ECD analysis. The NPD, FPD, and HECD detectors are element specific, but are still subject to interferences. UV detectors for HPLC are nearly universal, and the electrochemical detector may also respond to a variety of chemicals. Mass spectrometric analyses will generally provide positive identification of specific compounds.

6.3 PCBs and certain common pesticides (e.g., chlordane) are complex mixtures of individual compounds which can cause difficulty in accurately quantifying a particular formulation in a multiple component mixture. PCBs may interfere with the determination of pesticides.

6.4 Contamination of glassware and sampling apparatus with traces of pesticides or PCBs can be a major source of error, particularly at lower analyte concentrations. Careful attention to cleaning and handling procedures is required during all steps of sampling and analysis to minimize this source of error.

6.5 The general approaches listed below should be followed to minimize interferences.

6.5.1 Polar compounds, including certain pesticides (e.g., organophosphorus and carbamate classes) can be removed by column chromatography on alumina. Alumina clean-up will permit analysis of most common pesticides and PCBs (7).

6.5.2 PCBs may be separated from other common pesticides by column chromatography on silicic acid (8,9).

6.5.3 Many pesticides can be fractionated into groups by column chromatography on Florisil (9).

## 7. Safety

7.1 The toxicity or carcinogenicity of each reagent used in this method has not been precisely defined; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. The laboratory is responsible for maintaining a current awareness file of Occupational Safety and Health Administration (OSHA) regulations regarding the safe handling of the chemicals specified in this method. A reference file of material data handling sheets should also be made available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available and have been identified for the analyst (10-12).

7.2 PCBs have been classified as a known or suspected, human or mammalian carcinogen. Many of the other common pesticides have been classified as carcinogens. Care must be exercised when working with these substances. This method does not purport to address all safety problems associated with its use. It is the responsibility of whoever uses this method to consult and establish appropriate safety and health practices and

determine the applicability of regulatory limitations prior to use. The user should be thoroughly familiar with the chemical and physical properties of targeted substances.

7.3 Treat all target analytes as carcinogens. Neat compounds should be weighed in a glove box. Spent samples and unused standards are toxic waste and should be disposed according to regulations. Regularly check counter tops and equipment with "black light" for fluorescence as an indicator of contamination.

7.4 The collection efficiency for common pesticides and PCBs has been demonstrated to be greater than 95 percent for the sampling configuration described in the method (filter and backup adsorbent). Therefore, no field recovery evaluation will occur as part of this procedure.

## 8. Apparatus

*[Note: This method was developed using the PS-1 semi-volatile sampler provided by General Metal Works, Village of Cleves, OH as a guideline. EPA has experience in use of this equipment during various field monitoring programs over the last several years. Other manufacturers' equipment should work as well. However, modifications to these procedures may be necessary if another commercially available sampler is selected.]*

### 8.1 Sampling

**8.1.1 High-volume sampler (see Figure 1).** Capable of pulling ambient air through the filter/adsorbent cartridge at a flow rate of approximately 8 standard cubic feet per minute (scfm) (0.225 std m<sup>3</sup>/min) to obtain a total sample volume of greater than 300 scm over a 24-hour period. Major manufacturers are:

- Tisch Environmental, Village of Cleves, OH
- Andersen Instruments Inc., 500 Technology Ct., Smyrna, GA
- Thermo Environmental Instruments, Inc., 8 West Forge Parkway, Franklin, MA

**8.1.2 Sampling module (see Figure 2).** Metal filter holder (Part 2) capable of holding a 102-mm circular particle filter supported by a 16-mesh stainless-steel screen and attaching to a metal cylinder (Part 1) capable of holding a 65-mm O.D. (60-mm I.D.) x 125-mm borosilicate glass sorbent cartridge containing PUF. The filter holder is equipped with inert sealing gaskets (e.g., polytetrafluorethylene) placed on either side of the filter. Likewise, inert, pliable gaskets (e.g., silicone rubber) are used to provide an air-tight seal at each end of the glass sorbent cartridge. The glass sorbent cartridge is indented 20 mm from the lower end to provide a support for a 16-mesh stainless-steel screen that holds the sorbent. The glass sorbent cartridge fits into Part 1, which is screwed onto Part 2 until the sorbent cartridge is sealed between the silicone gaskets. Major manufacturers are:

- Tisch Environmental, Village of Cleves, OH
- Andersen Instruments Inc., 500 Technology Ct., Smyrna, GA
- Thermo Environmental Instruments, Inc., 8 West Forge Parkway, Franklin, MA

A field portable unit has been developed by EPA (see Figure 3).

**8.1.3 High-volume sampler calibrator.** Capable of providing multipoint resistance for the high-volume sampler. Major manufacturers are:

- Tisch Environmental, Village of Cleves, OH
- Andersen Instruments Inc., 500 Technology Ct., Smyrna, GA
- Thermo Environmental Instruments, Inc., 8 West Forge Parkway, Franklin, MA

**8.1.4 Ice chest.** To hold samples at  $<4^{\circ}\text{C}$  or below during shipment to the laboratory after collection.

**8.1.5 Data sheets.** For each sample for recording the location and sample time, duration of sample, starting time, and volume of air sampled.

## 8.2 Sample Clean-up and Concentration (see Figure 4).

**8.2.1 Soxhlet apparatus extractor (see Figure 4a).** Capable of extracting filter and adsorbent cartridges (2.3" x 5" length), 1,000 mL flask, and condenser, best source.

**8.2.2 Pyrex glass tube furnace system.** For activating silica gel at  $180^{\circ}\text{C}$  under purified nitrogen gas purge for an hour, with capability of raising temperature gradually, best source.

**8.2.3 Glass vial.** 40 mL, best source.

**8.2.4 Erlenmeyer flask.** 50 mL, best source.

*[Note: Reuse of glassware should be minimized to avoid the risk of cross contamination. All glassware that is used, especially glassware that is reused, must be scrupulously cleaned as soon as possible after use. Rinse glassware with the last solvent used in it and then with high-purity acetone and hexane. Wash with hot water containing detergent. Rinse with copious amount of tap water and several portions of distilled water. Drain, dry, and heat in a muffle furnace at  $400^{\circ}\text{C}$  for 4 hours. Volumetric glassware must not be heated in a muffle furnace; rather, it should be rinsed with high-purity acetone and hexane. After the glassware is dry and cool, rinse it with hexane, and store it inverted or capped with solvent-rinsed aluminum foil in a clean environment.]*

**8.2.5 White cotton gloves.** For handling cartridges and filters, best source.

**8.2.6 Minivials.** 2 mL, borosilicate glass, with conical reservoir and screw caps lined with Teflon®-faced silicone disks, and a vial holder, best source.

**8.2.7 Teflon®-coated stainless steel spatulas and spoons.** Best source.

**8.2.8 Kuderna-Danish (K-D) apparatus (see Figure 4b).** 500 mL evaporation flask (Kontes K-570001-500 or equivalent), 10 mL graduated concentrator tubes (Kontes K570050-1025 or equivalent) with ground-glass stoppers, and 3-ball macro Snyder Column (Kontes K-570010500, K-50300-0121, and K-569001-219, or equivalent), best source.

**8.2.9 Adsorption column for column chromatography (see Figure 4c).** 1-cm x 10-cm with stands.

**8.2.10 Glove box.** For working with extremely toxic standards and reagents with explosion-proof hood for venting fumes from solvents, reagents, etc.

**8.2.11 Vacuum oven.** Vacuum drying oven system capable of maintaining a vacuum at 240 torr (flushed with nitrogen) overnight.

**8.2.12 Concentrator tubes and a nitrogen evaporation apparatus with variable flow rate.** Best source.

**8.2.13 Laboratory refrigerator.** Best source.

**8.2.14 Boiling chips.** Solvent extracted, 10/40 mesh silicon carbide or equivalent, best source.

**8.2.15 Water bath.** Heated, with concentric ring cover, capable of  $\pm 5^{\circ}\text{C}$  temperature control, best source.

**8.2.16 Nitrogen evaporation apparatus.** Best source.

**8.2.17 Glass wool.** High purity grade, best source.

### 8.3 Sample Analysis

**8.3.1 Gas chromatograph (GC).** The GC system should be equipped with appropriate detector(s) and either an isothermally controlled or temperature programmed heating oven. Improved detection limits may be obtained with a GC equipped with a cool on-column or splitless injector.

**8.3.2 Gas chromatographic column.** As an example, a 0.32-mm (I.D.) x 3-mm DB-5, DB-17, DB-608, DB-1701 are available. Other columns may also provide acceptable results.

**8.3.3 HPLC column.** As an example, a 4.6-mm x 25-cm Zorbax SIL or  $\mu$ Bondpak C-18. Other columns may also provide acceptable results.

**8.3.4 Microsyringes.** 5  $\mu$ L volume or other appropriate sizes.

**8.3.5 Balance.** Mettler balance or equivalent.

**8.3.6 All required syringes, gases, and other pertinent supplies.** To operate the GC/MS system.

**8.3.7 Pipettes, micropipettes, syringes, burets, etc.** To make calibration and spiking solutions, dilute samples if necessary, etc., including syringes for accurately measuring volumes such as 25  $\mu$ L and 100  $\mu$ L.

## 9. Equipment and Materials

### 9.1 Materials for Sample Collection (see Figure 5)

**9.1.1 Quartz fiber filter.** 102-millimeter bindless quartz microfiber filter, Whatman Inc., 6 Just Road, Fairfield, NJ 07004, Filter Type QMA-4.

**9.1.2 Polyurethane foam (PUF) plugs (see Figure 5a).** 3-inch thick sheet stock polyurethane type (density .022 g/cm<sup>3</sup>). The PUF should be of the polyether type used for furniture upholstery, pillows, and mattresses. The PUF cylinders (plugs) should be slightly larger in diameter than the internal diameter of the cartridge. Sources of equipment are Tisch Environmental, Village of Cleves, OH; University Research Glassware, 116 S. Merritt Mill Road, Chapel Hill, NC; Thermo Environmental Instruments, Inc., 8 West Forge Parkway, Franklin, MA; Supelco, Supelco Park, Bellefonte, PA; and SKC Inc., 334 Valley View Road, Eighty Four, PA.

**9.1.3 Teflon® end caps (see Figure 5a).** For sample cartridge. Sources of equipment are Tisch Environmental, Village of Cleves, OH and University Research Glassware, Chapel Hill, NC.

**9.1.4 Sample cartridge aluminum shipping containers (see Figure 5b).** For sample cartridge shipping. Sources of equipment are Tisch Environmental, Village of Cleves, OH and University Research Glassware, Chapel Hill, NC.

**9.1.5 Glass sample cartridge (see Figure 5a).** For sample collection. Sources of equipment are Tisch Environmental, Village of Cleves, OH; Thermo Environmental Instruments, Inc., 8 West Forge Parkway, Franklin, MA; University Research Glassware, 116 S. Merritt Mill Road, Chapel Hill, NC; and Supelco, Supelco Park, Bellefonte, PA.

**9.1.6 Aluminum foil.** Best source.

**9.1.7 Hexane, reagent grade.** Best source.

### 9.2 Sample Extraction and Concentration

**9.2.1 Methylene chloride.** Chromatographic grade, glass-distilled, best source.

**9.2.2 Sodium sulfate-anhydrous (ACS).** Granular (purified by washing with methylene chloride followed by heating at 400°C for 4 hours in a shallow tray).

**9.2.3 Boiling chips.** Solvent extracted or heated in a muffle furnace at 450°C for 2 hours, approximately 10/40 mesh (silicon carbide or equivalent).

- 9.2.4 **Nitrogen.** High purity grade, best source.
- 9.2.5 **Ether.** Chromatographic grade, glass-distilled, best source.
- 9.2.6 **Hexane.** Chromatographic grade, glass-distilled, best source.
- 9.2.7 **Dibromobiphenyl.** Chromatographic grade, best source. Used for internal standard.
- 9.2.8 **Decafluorobiphenyl.** Chromatographic grade, best source. Used for internal standard.
- 9.2.9 **Glass wool.** Silanized, extracted with methylene chloride and hexane, and dried.
- 9.2.10 **Diethyl ether.** High purity, glass distilled.
- 9.2.11 **Hexane.** High purity, glass distilled.
- 9.2.12 **Silica gel.** High purity, type 60, 70-230 mesh.
- 9.2.13 **Round bottom evaporative flask.** 500 mL, T 24/40 joints, best source.
- 9.2.14 **Capacity soxhlet extractors.** 500 mL, with reflux condensers, best source.
- 9.2.15 **Kuderna-Danish concentrator.** 500 mL, with Snyder columns, best source.
- 9.2.16 **Graduated concentrator tubes.** 10 mL, with 19/22 stoppers, best source.
- 9.2.17 **Graduated concentrator tubes.** 1 mL, with 14/20 stoppers, best source.
- 9.2.18 **TFE fluorocarbon tape.** 1/2 in., best source.
- 9.2.19 **Filter tubes.** Size 40-mm (I.D.) x 80-mm.
- 9.2.20 **Serum vials.** 1 mL and 5 mL, fitted with caps lined with TFE fluorocarbon.
- 9.2.21 **Pasteur pipetter.** 9 in., best source.
- 9.2.22 **Glass wool.** Fired at 500°C, best source.
- 9.2.23 **Alumina.** Activity Grade IV, 100/200 mesh.
- 9.2.24 **Glass chromatographic column.** 2-mm I.D. x 15-cm long.
- 9.2.25 **Vacuum oven.** Connected to water aspirator, best source.
- 9.2.26 **Die.** Best source.
- 9.2.27 **Ice chest.** Best source.
- 9.2.28 **Silicic Acid.** Pesticide quality, best source.
- 9.2.29 **Octachloronaphthalene (OCN).** Research grade, best source.
- 9.2.30 **Florisil.** Pesticide quality, best source.

### 9.3 GC Sample Analysis

- 9.3.1 **Gas cylinders of hydrogen, nitrogen, argon/methane, and helium.** Ultra high purity, best source.
- 9.3.2 **Combustion air.** Ultra high purity, best source.
- 9.3.3 **Zero air.** Zero air may be obtained from a cylinder or zero-grade compressed air scrubbed with Drierite® or silica gel and 5A molecular sieve or activated charcoal, or by catalytic cleanup of ambient air. All zero air should be passed through a liquid argon cold trap for final cleanup.
- 9.3.4 **Chromatographic-grade stainless steel tubing and stainless steel fitting.** For interconnections, Alltech Applied Science, 2051 Waukegan Road, Deerfield, IL 60015, 312-948-8600, or equivalent.

*[Note: All such materials in contact with the sample, analyte, or support gases prior to analysis should be stainless steel or other inert metal. Do not use plastic or Teflon® tubing or fittings.]*

### 10. Preparation of PUF Sampling Cartridge

*[Note: This method was developed using the PS-1 sample cartridge provider by General Metal Works, Village of Cleves, OH as a guideline. EPA has experience in use of this equipment during various field monitoring*

programs over the last several years. Other manufacturers' equipment should work as well. However, modifications to these procedures may be necessary if another commercially available sampler is selected.]

## 10.1 Summary of Method

**10.1.1** This part of Compendium Method TO-4A discusses pertinent information regarding the preparation and cleaning of the filter, adsorbent, and filter/adsorbent cartridge assembly. The separate batches of filters and adsorbents are extracted with the appropriate solvent.

**10.1.2** At least one PUF cartridge assembly and one filter from each batch, or 10 percent of the batch, whichever is greater, should be tested and certified clean before the batch is considered for field use.

## 10.2 Preparation of Sampling Cartridge

**10.2.1** Bake the Whatman QMA-4 quartz filters at 400°C for 5 hours before use.

**10.2.2** Set aside the filters in a clean container for shipment to the field or prior to combining with the PUF glass cartridge assembly for certification prior to field deployment.

**10.2.3** The PUF plugs are 6.0-cm diameter cylindrical plugs cut from 3-inch sheet stock and should fit, with slight compression, in the glass cartridge, supported by the wire screen (see Figure 2). During cutting, rotate the die at high speed (e.g., in a drill press) and continuously lubricate with deionized or distilled water. Pre-cleaned PUF plugs can be obtained from many of the commercial sources identified in Section 9.1.2.

**10.2.4** For initial cleanup, place the PUF plugs in a Soxhlet apparatus and extract with acetone for 16 hours at approximately 4 cycles per hour. When cartridges are reused, use diethyl ether/hexane (10 percent volume/volume [v/v]) as the cleanup solvent.

*[Note: A modified PUF cleanup procedure can be used to remove unknown interference components of the PUF blank. This method consists of rinsing 50 times with toluene, acetone, and diethyl ether/hexane (5 to 10 percent v/v), followed by Soxhlet extraction. The extracted PUF is placed in a vacuum oven connected to a water aspirator and dried at room temperature for approximately 2 to 4 hours (until no solvent odor is detected). Alternatively, they may be dried at room temperature in an air-tight container with circulating nitrogen (zero grade). Place the clean PUF plug into a labeled glass sampling cartridge using gloves and forceps. Wrap the cartridge with hexane-rinsed aluminum foil and placed in a jar fitted with TFE fluorocarbon-lined caps. The foil wrapping may also be marked for identification using a blunt probe. The extract from the Soxhlet extraction procedure from each batch may be analyzed to determine initial cleanliness prior to certification.]*

**10.2.5** Fit a nickel or stainless steel screen (mesh size 200/200) to the bottom of a hexane-rinsed glass sampling cartridge to retain the PUF adsorbents, as illustrated in Figure 2. Place the Soxhlet-extracted, vacuum-dried PUF (2.5-cm thick by 6.5-cm diameter) on top of the screen in the glass sampling cartridge using polyester gloves.

**10.2.6** Wrap the sampling cartridge with hexane-rinsed aluminum foil, cap with the Teflon® end caps, place in a cleaned labeled aluminum shipping container, and seal with Teflon® tape. Analyze at least 1 PUF plug from each batch of PUF plugs using the procedure described in Section 10.3, before the batch is considered acceptable for field use. A blank level of <10 ng/plug and filter for single component compounds is considered to be acceptable. For multiple component mixtures (e.g., PCBs), the blank level should be <100 ng/plug and filter. Cartridges are considered clean for up to 30 days from date of certification when stored in their sealed containers.

### 10.3 Procedure for Certification of PUF Cartridge Assembly

**10.3.1** Extract 1 filter and PUF adsorbent cartridge by Soxhlet extraction and concentrate using a Kuderna-Danish (K-D) evaporator for each lot of filters and cartridges sent to the field.

**10.3.2** Assemble the Soxhlet apparatus. Charge the Soxhlet apparatus (see Figure 4a) with 300 mL of the extraction solvent [10 percent (v/v) diethyl ether/hexane] and reflux for 2 hours. Let the apparatus cool, disassemble it, and discard the used extraction solvent. Transfer the filter and PUF glass cartridge to the Soxhlet apparatus (the use of an extraction thimble is optional).

*[Note: The filter and adsorbent assembly are extracted together in order to reach detection limits, to minimize cost and to prevent misinterpretation of the data. Separate analyses of the filter and PUF would not yield useful information about the physical state of most of the common pesticides and PCBs at the time of sampling due to evaporative losses of the analyte from the filter during sampling.]*

**10.3.3** Add between 300 and 350 mL of diethyl ether/hexane (10 percent v/v) to the Soxhlet apparatus. Reflux the sample for 18 hours at a rate of at least 3 cycles per hour. Allow to cool, then disassemble the apparatus.

**10.3.4** Assemble a K-D concentrator (see Figure 4b) by attaching a 10-mL concentrator tube to a 500-mL evaporative flask.

**10.3.5** Transfer the extract by pouring it through a drying column containing about 10 cm of anhydrous granular sodium sulfate (see Figure 4c) and collect the extract in the K-D concentrator. Rinse the Erlenmeyer flask and column with 20 to 30 mL of 10 percent diethyl ether/hexane to complete the quantitative transfer.

**10.3.6** Add 1 or 2 clean boiling chips and attach a 3-ball Snyder column to the evaporative flask. Pre-wet the Snyder column by adding about 1 mL of the extraction solvent to the top of the column. Place the K-D apparatus on a hot water bath (50°C) so that the concentrator tube is partially immersed in the hot water, and the entire lower rounded surface of the flask is bathed with hot vapor. Adjust the vertical position of the apparatus and the water temperature as required to complete the concentration in one hour. At the proper rate of distillation, the balls of the column will actively chatter but the chambers will not flood with condensed solvent. When the apparent volume of liquid reaches approximately 5 mL, remove the K-D apparatus from the water bath and allow it to drain and cool for at least 5 minutes. Remove the Snyder column and rinse the flask and its lower joint into the concentrator tube with 5 mL of hexane. A 5-mL syringe is recommended for this operation.

*[Note: The solvent may have to be exchanged to another solvent to meet the requirements of the analytical procedure selected for the target analytes.]*

**10.3.7** Concentrate the extract to 1 mL and analyze according to Section 13.

**10.3.8** Acceptable levels of common pesticides must be less than 10 ng for each pair of filter and adsorbent assembly analyzed. For multiple component mixtures (e.g., PCBs), the blank level should be less than 100 ng for each pair of filter and adsorbent. Once certified clean, the cartridges can be shipped to the field without being chilled.

## 11. Assembly, Calibration and Collection Using High-Volume Sampling System

*[Note: This method was developed using the PS-1 semi-volatile sampler provided by General Metal Works, Village of Cleves, OH as a guideline. EPA has experience in use of this equipment during various field monitoring programs over the last several years. Other manufacturers' equipment should work as well.]*

*However, modifications to these procedures may be necessary if another commercially available sampler is selected.]*

### 11.1 Description of Sampling Apparatus

The entire sampling system is diagrammed in Figure 1. This apparatus was developed to operate at a rate of 4 to 10 scfm (0.114 to 0.285 std m<sup>3</sup>/min) and is used by EPA for high-volume sampling of ambient air. The method write-up presents the use of this device.

The sampling module (see Figure 2) consists of a filter and a glass sampling cartridge containing the PUF utilized to concentrate common pesticides and PCBs from the air. A field portable unit has been developed by EPA (see Figure 3).

### 11.2 Calibration of Sampling System

Each sampler should be calibrated (1) when new, (2) after major repairs or maintenance, (3) whenever any audit point deviates from the calibration curve by more than 7 percent, (4) before/after each sampling event, and (5) when a different sample collection media, other than that which the sampler was originally calibrated to, will be used for sampling.

**11.2.1 Calibration of Orifice Transfer Standard.** Calibrate the modified high volume air sampler in the field using a calibrated orifice flow rate transfer standard. Certify the orifice transfer standard in the laboratory against a positive displacement rootsmeter (see Figure 6). Once certified, the recertification is performed rather infrequently if the orifice is protected from damage. Recertify the orifice transfer standard performed once per year utilizing a set of five multiple resistance plates.

*[Note: The set of five multihole resistance plates are used to change the flow through the orifice so that several points can be obtained for the orifice calibration curve. The following procedure outlines the steps to calibrate the orifice transfer standard in the laboratory.]*

**11.2.1.1** Record the room temperature ( $T_1$  in °C) and barometric pressure ( $P_b$  in mm Hg) on the Orifice Calibration Data Sheet (see Figure 7). Calculate the room temperature in K (absolute temperature) and record on Orifice Calibration Data Sheet.

$$T_1 \text{ in K} = 273^\circ + T_1 \text{ in } ^\circ\text{C}$$

**11.2.1.2** Set up laboratory orifice calibration equipment as illustrated in Figure 6. Check the oil level of the rootsmeter prior to starting. There are 3 oil level indicators, 1 at the clear plastic end and 2 site glasses, 1 at each end of the measuring chamber.

**11.2.1.3** Check for leaks by clamping both manometer lines, blocking the orifice with cellophane tape, turning on the high volume motor, and noting any change in the rootsmeter's reading. If the rootsmeter's reading changes, there is a leak in the system. Eliminate the leak before proceeding. If the rootsmeter's reading remains constant, turn off the hi-vol motor, remove the cellophane tape, and unclamp both manometer lines.

**11.2.1.4** Install the 5-hole resistance plate between the orifice and the filter adapter.

**11.2.1.5** Turn manometer tubing connectors 1 turn counter-clockwise. Make sure all connectors are open.

**11.2.1.6** Adjust both manometer midpoints by sliding their movable scales until the zero point corresponds with the meniscus. Gently shake or tap to remove any air bubbles and/or liquid remaining on tubing connectors. (If additional liquid is required for the water manometer, remove tubing connector and add clean water.)

**11.2.1.7** Turn on the high volume motor and let it run for 5 minutes to set the motor brushes. Turn the motor off. Insure manometers are set to zero. Turn the high volume motor on.

**11.2.1.8** Record the time, in minutes, required to pass a known volume of air (approximately 200 to 300 ft<sup>3</sup> of air for each resistance plate) through the rootsmeter by using the rootsmeter's digital volume dial and a stopwatch.

**11.2.1.9** Record both manometer readings-orifice water manometer ( $\Delta H$ ) and rootsmeter mercury manometer ( $\Delta P$ ) on Orifice Calibration Data Sheet (see Figure 7).

*[Note:  $\Delta H$  is the sum of the difference from zero (0) of the two column heights.]*

**11.2.1.10** Turn off the high volume motor.

**11.2.1.11** Replace the 5-hole resistance plate with the 7-hole resistance plate.

**11.2.1.12** Repeat Sections 11.2.1.3 through 11.2.1.11.

**11.2.1.13** Repeat for each resistance plate. Note results on Orifice Calibration Data Sheet (see Figure 7). Only a minute is needed for warm-up of the motor. Be sure to tighten the orifice enough to eliminate any leaks. Also check the gaskets for cracks.

*[Note: The placement of the orifice prior to the rootsmeter causes the pressure at the inlet of the rootsmeter to be reduced below atmospheric conditions, thus causing the measured volume to be incorrect. The volume measured by the rootsmeter must be corrected.]*

**11.2.1.14** Correct the measured volumes on the Orifice Calibration Data Sheet:

$$V_{\text{std}} = V_m \left( \frac{P_a - \Delta P}{P_{\text{std}}} \right) \left( \frac{T_{\text{std}}}{T_a} \right)$$

where:

$V_{\text{std}}$  = standard volume, std m<sup>3</sup>

$V_m$  = actual volume measured by the rootsmeter, m<sup>3</sup>

$P_a$  = barometric pressure during calibration, mm Hg

$\Delta P$  = differential pressure at inlet to volume meter, mm Hg

$P_{\text{std}}$  = 760 mm Hg

$T_{\text{std}}$  = 273 + 25°C = 298 K

$T_a$  = ambient temperature during calibration, K.

**11.2.1.15** Record standard volume on Orifice Calibration Data Sheet.

**11.2.1.16** The standard flow rate as measured by the rootsmeter can now be calculated using the following formula:

$$Q_{\text{std}} = \frac{V_{\text{std}}}{\theta}$$

where:

$Q_{\text{std}}$  = standard volumetric flow rate, std m<sup>3</sup>/min

$\theta$  = elapsed time, min

11.2.1.17 Record the standard flow rates to the nearest 0.01 std m<sup>3</sup>/min.

11.2.1.18 Calculate and record  $\sqrt{\Delta H (P_1/P_{std})(298/T_1)}$  value for each standard flow rate.

11.2.1.19 Plot each  $\sqrt{\Delta H (P_1/P_{std})(298/T_1)}$  value (y-axis) versus its associated standard flow rate (x-axis) on arithmetic graph paper and draw a line of best fit between the individual plotted points.

[*Note: This graph will be used in the field to determine standard flow rate.*]

#### 11.2.2 Calibration of the High Volume Sampling System Utilizing Calibrated Orifice Transfer Standard

For this calibration procedure, the following conditions are assumed in the field:

- The sampler is equipped with a valve to control sample flow rate.
- The sample flow rate is determined by measuring the orifice pressure differential, using a Magnehelic gauge.
- The sampler is designed to operate at a standardized volumetric flow rate of 8 ft<sup>3</sup>/min (0.225 m<sup>3</sup>/min), with an acceptable flow rate range within 10 percent of this value.
- The transfer standard for the flow rate calibration is an orifice device. The flow rate through the orifice is determined by the pressure drop caused by the orifice and is measured using a "U" tube water manometer or equivalent.
- The sampler and the orifice transfer standard are calibrated to standard volumetric flow rate units (scfm or scmm).
- An orifice transfer standard with calibration traceable to NIST is used.
- A "U" tube water manometer or equivalent, with a 0- to 16-inch range and a maximum scale division of 0.1 inch, will be used to measure the pressure in the orifice transfer standard.
- A Magnehelic gauge or equivalent, with a 9- to 100-inch range and a minimum scale division of 2 inches for measurements of the differential pressure across the sampler's orifice is used.
- A thermometer capable of measuring temperature over the range of 32° to 122°F (0° to 50°C) to ±2°F (±1°C) and referenced annually to a calibrated mercury thermometer is used.
- A portable aneroid barometer (or equivalent) capable of measuring ambient barometric pressure between 500 and 800 mm Hg (19.5 and 31.5 in. Hg) to the nearest mm Hg and referenced annually to a barometer of known accuracy is used.
- Miscellaneous handtools, calibration data sheets or station log book, and wide duct tape are available.

11.2.2.1 Set up the calibration system as illustrated in Figure 8. Monitor the airflow through the sampling system with a venturi/Magnehelic assembly, as illustrated in Figure 8. Audit the field sampling system once per quarter using a flow rate transfer standard, as described in the EPA *High Volume-Sampling Method, 40 CFR 50, Appendix B*. Perform a single-point calibration before and after each sample collection, using the procedures described in Section 11.2.3.

11.2.2.2 Prior to initial multi-point calibration, place an empty glass cartridge in the sampling head and activate the sampling motor. Fully open the flow control valve and adjust the voltage variator so that a sample flow rate corresponding to 110 percent of the desired flow rate (typically 0.20 to 0.28 m<sup>3</sup>/min) is indicated on the Magnehelic gauge (based on the previously obtained multipoint calibration curve). Allow the motor to warm up for 10 minutes and then adjust the flow control valve to achieve the desired flow rate. Turn off the sampler. Record the ambient temperature and barometric pressure on the Field Calibration Data Sheet (see Figure 9).

11.2.2.3 Place the orifice transfer standard on the sampling head and attach a manometer to the tap on the transfer standard, as illustrated in Figure 8. Properly align the retaining rings with the filter holder and secure

by tightening the three screw clamps. Connect the orifice transfer standard by way of the pressure tap to a manometer using a length of tubing. Set the zero level of the manometer or Magnehelic. Attach the Magnehelic gauge to the sampler venturi quick release connections. Adjust the zero (if needed) using the zero adjust screw on face of the gauge.

**11.2.2.4** To leak test, block the orifice with a rubber stopper, wide duct tape, or other suitable means. Seal the pressure port with a rubber cap or similar device. Turn on the sampler.

*Caution:* Avoid running the sampler for too long a time with the orifice blocked. This precaution will reduce the chance that the motor will be overheated due to the lack of cooling air. Such overheating can shorten the life of the motor.

**11.2.2.5** Gently rock the orifice transfer standard and listen for a whistling sound that would indicate a leak in the system. A leak-free system will not produce an upscale response on the sampler's Magnehelic. Leaks are usually caused either by damaged or missing gaskets by cross-threading and/or not screwing sample cartridge together tightly. All leaks must be eliminated before proceeding with the calibration. When the sample is determined to be leak-free, turn off the sampler and unblock the orifice. Now remove the rubber stopper or plug from the calibrator orifice.

**11.2.2.6** Turn the flow control valve to the fully open position and turn the sampler on. Adjust the flow control valve until a Magnehelic reading of approximately 70 in. is obtained. Allow the Magnehelic and manometer readings to stabilize and record these values on the orifice transfer Field Calibration Data Sheet (see Figure 9).

**11.2.2.7** Record the manometer reading under Y1 and the Magnehelic reading under Y2 on the Field Calibration Data Sheet. For the first reading, the Magnehelic should still be at 70 inches as set above.

**11.2.2.8** Set the Magnehelic to 60 inches by using the sampler's flow control valve. Record the manometer (Y1) and Magnehelic (Y2) readings on the Field Calibration Data Sheet (see Figure 9).

**11.2.2.9** Repeat the above steps using Magnehelic settings of 50, 40, 30, 20, and 10 inches.

**11.2.2.10** Turn the voltage variator to maximum power, open the flow control valve, and confirm that the Magnehelic reads at least 100 inches. Turn off the sampler and confirm that the Magnehelic reads zero.

**11.2.2.11** Read and record the following parameters on the Field Calibration Data Sheet. Record the following on the calibration data sheet:

Data, job number, and operator's signature;

- Sampler serial number;
- Ambient barometric pressure; and
- Ambient temperature.

**11.2.2.12** Remove the "dummy" cartridge and replace with a sample cartridge.

**11.2.2.13** Obtain the Manufacturer High Volume Orifice Calibration Certificate.

**11.2.2.14** If not performed by the manufacturer, calculate values for each calibrator orifice static pressure (Column 6, inches of water) on the manufacturer's calibration certificate using the following equation:

$$\sqrt{\Delta H(P_a/760)(298/[T_a + 273])}$$

where:

$P_a$  = the barometric pressure (mm Hg) at time of manufacturer calibration, mm Hg

$T_a$  = temperature at time of calibration, °C

**11.2.2.15** Perform a linear regression analysis using the values in Column 7 of the manufacturer High Volume Orifice Calibration Certificate for flow rate ( $Q_{std}$ ) as the "X" values and the calculated values as the Y

values. From this relationship, determine the correlation (CC1), intercept (B1), and slope (M1) for the Orifice Transfer Standard.

**11.2.2.16** Record these values on the Field Calibration Data Sheet (see Figure 9).

**11.2.2.17** Using the Field Calibration Data Sheet values (see Figure 9), calculate the Orifice Manometer Calculated Values (Y3) for each orifice manometer reading using the following equation:

#### Y3 Calculation

$$Y3 = [Y1(P_a/760)(298/\{T_a + 273\})]^{1/2}$$

**11.2.2.18** Record the values obtained in Column Y3 on the Field Calibration Data Sheet (see Figure 9).

**11.2.2.19** Calculate the Sampler Magnehelic Calculate Values (Y4) using the following equation:

#### Y4 Calculation

$$Y4 = [Y2(P_a/760)(298/\{T_a + 273\})]^{1/2}$$

**11.2.2.20** Record the value obtained in Column Y4 on the Field Calibration Data Sheet (see Figure 9).

**11.2.2.21** Calculate the Orifice Flow Rate (X1) in scm, using the following equation:

#### X1 Calculation

$$X1 = \frac{Y3 - B1}{M1}$$

**11.2.2.22** Record the values obtained in Column X1, on the Field Calibration Data Sheet (see Figure 9).

**11.2.2.23** Perform a linear regression of the values in Column X1 (as X) and the values in Column Y4 (as Y). Record the relationship for correlation (CC2), intercept (B2), and slope (M2) on the Field Calibration Data Sheet.

**11.2.2.24** Using the following equation, calculate a set point (SP) for the manometer to represent a desired flow rate:

$$\text{Set point (SP)} = [( \text{Expected } P_a ) / ( \text{Expected } T_a ) ( T_{\text{std}} / P_{\text{std}} )] [ M2 (\text{Desired flow rate}) + B2 ]^2$$

where:

- $P_a$  = Expected atmospheric pressure ( $P_a$ ), mm Hg
- $T_a$  = Expected atmospheric temperature ( $T_a$ ), °C
- M2 = Slope of developed relationship
- B2 = Intercept of developed relationship
- $T_{\text{std}}$  = Temperature standard, 25°C
- $P_{\text{std}}$  = Pressure standard, 760 mm Hg

**11.2.2.25** During monitoring, calculate a flow rate from the observed Magnehelic reading using the following equations:

$$Y5 = [\text{Average Magnehelic Reading } (\Delta H) (P_a/T_a)(T_{std}/P_{std})]^{1/2}$$

$$X2 = \frac{Y5 - B2}{M2}$$

where:

- Y5 = Corrected Magnehelic reading
- X2 = Instant calculated flow rate, scm

**11.2.2.26** The relationship in calibration of a sampling system between Orifice Transfer Standard and flow rate through the sampler is illustrated in Figure 10.

**11.2.3 Single-Point Audit of the High Volume Sampling System Utilizing Calibrated Orifice Transfer Standard**

Single point calibration checks are required as follows:

- Prior to the start of each 24-hour test period.
- After each 24-hour test period. The post-test calibration check may serve as the pre-test calibration check for the next sampling period if the sampler is not moved.
- Prior to sampling after a sample is moved.

For samplers, perform a calibration check for the operational flow rate before each 24-hour sampling event and when required as outlined in the user quality assurance program. The purpose of this check is to track the sampler's calibration stability. Maintain a control chart presenting the percentage difference between a sampler's indicated and measured flow rates. This chart provides a quick reference of sampler flow-rate drift problems and is useful for tracking the performance of the sampler. Either the sampler log book or a data sheet will be used to document flowcheck information. This information includes, but is not limited to, sampler and orifice transfer standard serial number, ambient temperature, pressure conditions, and collected flow-check data.

In this subsection, the following is assumed:

- The flow rate through a sampler is indicated by the orifice differential pressure;
- Samplers are designed to operate at an actual flow rate of 8 scfm, with a maximum acceptable flow-rate fluctuation range of  $\pm 10$  percent of this value;
- The transfer standard will be an orifice device equipped with a pressure tap. The pressure is measured using a manometer; and
- The orifice transfer standard's calibration relationship is in terms of standard volumetric flow rate ( $Q_{std}$ ).

**11.2.3.1** Perform a single point flow audit check before and after each sampling period utilizing the Calibrated Orifice Transfer Standard (see Section 11.2.1).

**11.2.3.2** Prior to single point audit, place a "dummy" glass cartridge in the sampling head and activate the sampling motor. Fully open the flow control valve and adjust the voltage variator so that a sample flow rate corresponding to 110 percent of the desired flow rate (typically 0.19 to 0.28 m<sup>3</sup>/min) is indicated on the Magnehelic gauge (based on the previously obtained multipoint calibration curve). Allow the motor to warm up for 10 minutes and then adjust the flow control valve to achieve the desired flow rate. Turn off the sampler. Record the ambient temperature and barometric pressure on the Field Test Data Sheet (see Figure 11).

**11.2.3.3** Place the flow rate transfer standard on the sampling head.

**11.2.3.4** Properly align the retaining rings with the filter holder and secure by tightening the 3 screw clamps. Connect the flow rate transfer standard to the manometer using a length of tubing.

**11.2.3.5** Using tubing, attach 1 manometer connector to the pressure tap of the transfer standard. Leave the other connector open to the atmosphere.

**11.2.3.6** Adjust the manometer midpoint by sliding the movable scale until the zero point corresponds with the water meniscus. Gently shake or tap to remove any air bubbles and/or liquid remaining on tubing connectors. (If additional liquid is required, remove tubing connector and add clean water.)

**11.2.3.7** Turn on high-volume motor and let run for 5 minutes.

**11.2.3.8** Record the pressure differential indicated,  $\Delta H$ , in inches of water, on the Field Test Data Sheet. Be sure stable  $\Delta H$  has been established.

**11.2.3.9** Record the observed Magnahelic gauge reading, in inches of water, on the Field Test Data Sheet. Be sure stable  $\Delta M$  has been established.

**11.2.3.10** Using previous established Orifice Transfer Standard curve, calculate  $Q_{xs}$  (see Section 11.2.2.23).

**11.2.3.11** This flow should be within  $\pm 10$  percent of the sampler set point, normally, 8 ft<sup>3</sup>. If not, perform a new multipoint calibration of the sampler.

**11.2.3.12** Remove flow rate transfer standard and dummy adsorbent cartridge.

### 11.3 Sample Collection

#### 11.3.1 General Requirements

**11.3.1.1** The sampler should be located in an unobstructed area, at least 2 meters from any obstacle to air flow. The exhaust hose should be stretched out in the downwind direction to prevent recycling of air into the sample head.

**11.3.1.2** All cleaning and sample module loading and unloading should be conducted in a controlled environment, to minimize any chance of potential contamination.

**11.3.1.3** When new or when using the sampler at a different location, all sample contact areas need to be cleared. Use triple rinses of reagent grade hexane contained in Teflon® rinse bottles. Allow the solvent to evaporate before loading the PUF modules.

#### 11.3.2 Preparing Cartridge for Sampling

**11.3.2.1** Detach the lower chamber of the cleaned sample head. While wearing disposable, clean, lint-free nylon, or powder-free surgical gloves, remove a clean glass adsorbent module from its shipping container. Remove the Teflon® end caps. Replace the end caps in the sample container to be reused after the sample has been collected.

**11.3.2.2** Insert the glass module into the lower chamber and tightly reattach the lower chambers to the module.

**11.3.2.3** Using clean rinsed (with hexane) Teflon-tipped forceps, carefully place a clean conditioned fiber filter atop the filter holder and secure in place by clamping the filter holder ring over the filter. Place the aluminum protective cover on top of the cartridge head. Tighten the 3 screw clamps. Ensure that all module connections are tightly assembled. Place a small piece of aluminum foil on the ball-joint of the sample cartridge to protect from back-diffusion of semi-volatile into the cartridge during transporting to the site.

*[Note: Failure to do so could result in air flow leaks at poorly sealed locations which could affect sample representativeness.]*

11.3.2.4 Place in a carrying bag to take to the sampler.

### 11.3.3 Collection

11.3.3.1 After the sampling system has been assembled, perform a single point flow check as described in Sections 11.2.3.

11.3.3.2 With the empty sample module removed from the sampler, rinse all sample contact areas using reagent grade hexane in a Teflon® squeeze bottle. Allow the hexane to evaporate from the module before loading the samples.

11.3.3.3 With the sample cartridge removed from the sampler and the flow control valve fully open, turn the pump on and allow it to warm-up for approximately 5 minutes.

11.3.3.4 Attach a "dummy" sampling cartridge loaded with the exact same type of filter and PUF media to be used for sample collection.

11.3.3.5 Turn the sampler on and adjust the flow control valve to the desired flow as indicated by the Magnehelic gauge reading determined in Section 11.2.2.24. Once the flow is properly adjusted, take extreme care not to inadvertently alter its setting.

11.3.3.6 Turn the sampler off and remove the "dummy" module. The sampler is now ready for field use.

11.3.3.7 Check the zero reading of the sampler Magnehelic. Record the ambient temperature, barometric pressure, elapsed time meter setting, sampler serial number, filter number, and PUF cartridge number on the Field Test Data Sheet (see Figure 11). Attach the loaded sampler cartridge to the sampler.

11.3.3.8 Place the voltage variator and flow control valve at the settings used in Section 11.3.2, and the power switch. Activate the elapsed time meter and record the start time. Adjust the flow (Magnehelic setting), if necessary, using the flow control valve.

11.3.3.9 Record the Magnehelic reading every 6 hours during the sampling period. Use the calibration factors (see Section 11.2.2.24) to calculate the desired flow rate. Record the ambient temperature, barometric pressure, and Magnehelic reading at the beginning and during sampling period.

### 11.3.4 Sample Recovery

11.3.4.1 At the end of the desired sampling period, turn the power off. Carefully remove the sampling head containing the filter and adsorbent cartridge. Place the protective "plate" over the filter to protect cartridge during transport to clean recovery area. Also, place a piece of aluminum foil around the bottom of adsorbent sampler head.

11.3.4.2 Perform a final calculated sampler flow check using the calibration orifice, as described in Section 11.3.2. If calibration deviates by more than 10 percent from initial reading, mark the flow data for that sample as suspect and inspect and/or remove from service, record results on Field Test Data Sheet, Figure 11.

11.3.4.3 Transport adsorbent sampler head to a clean recovery area.

11.3.4.4 While wearing disposable lint free nylon or powder-free surgical gloves, remove the PUF cartridge from the lower module chamber and lay it on the retained aluminum foil in which the sample was originally wrapped.

11.3.4.5 Carefully remove the glass fiber filter from the upper chamber using clean Teflon®-tipped forceps.

11.3.4.6 Fold the filter in half twice (sample side inward) and place it in the glass cartridge atop the PUF.

11.3.4.7 Wrap the combined samples in the original hexane rinsed aluminum foil, attached Teflon® end caps and place them in their *original* aluminum sample container. Complete a sample label and affix it to the aluminum shipping container.

11.3.4.8 Chain-of-custody should be maintained for all samples. Store the containers under dry ice and protect from UV light to prevent possibly photo-decomposition of collected analytes. If the time span between sample collection and laboratory analysis is to exceed 24 hours, refrigerate sample at 4°C.

11.3.4.9 Return at least 1 field filter/PUF blank to the laboratory with each group of samples. Treat a field blank exactly as the sample except that no air is drawn through the filter/adsorbent cartridge assembly.

**11.3.4.10** Ship and store field samples chilled ( $<4^{\circ}$ ) (blue ice is acceptable) until receipt at the analytical laboratory, after which they should be refrigerated at less than or equal to  $4^{\circ}\text{C}$ . Extraction must be performed within 7 days of sampling and analysis within 40 days of extraction.

## 12. Sample Extraction Procedure

*[Note: Sample extraction should be performed under a properly ventilated hood.]*

### 12.1 Sample Extraction

**12.1.1** All samples should be extracted within 1 week after collection. All samples should be stored at  $<4^{\circ}\text{C}$  until extracted.

**12.1.2** All glassware should be washed with a suitable detergent; rinsed with deionized water, acetone, and hexane; rinsed again with deionized water; and fired in an oven ( $500^{\circ}\text{C}$ ).

**12.1.3** Prepare a spiking solution for determination of extraction efficiency. The spiking solution should contain one or more surrogate compounds that have chemical structures and properties similar to those of the analytes of interest. Octachloronaphthalene (OCN) and dibutylchlorodate have been used as surrogates for determination of organochlorine pesticides by GC with an ECD. Tetrachloro-m-xylene and decachlorobiphenyl can also be used together to insure recovery of early and late eluting compounds. For organophosphate pesticides, tributylphosphate or triphenylphosphate may be employed as surrogates. The surrogate solution should be prepared so that addition of  $100\ \mu\text{L}$  into the PUF plug results in an extract containing the surrogate compound at the high end of the instrument's calibration range. As an example, the spiking solution for OCN is prepared by dissolving 10 mg of OCN in 10 mL of 10% acetone in n-hexane, followed by serial dilution n-hexane to achieve a final spiking solution of OCN is  $1\ \mu\text{g/mL}$ .

*[Note: Use the recoveries of the surrogate compounds to monitor for unusual matrix effects and gross sample processing errors. Evaluate surrogate recovery for acceptance by determining whether the measured concentration falls within the acceptance limits of 60-120 percent.]*

**12.1.4** The extracting solution (10% diethyl ether/hexane) is prepared by mixing 1800 mL of freshly opened hexane and 200 mL of freshly opened diethyl ether (preserved with ethanol) to a flask.

**12.1.5** All clean glassware, forceps, and other equipment to be used should be rinsed with 10% diethyl ether/hexane and placed on rinsed (10% diethyl ether/hexane) aluminum foil until use. The condensing towers should also be rinsed with 10% diethyl ether/hexane. Then add 700 mL of 10% diethyl ether/hexane to the 1,000 mL round bottom flask and add up to three boiling granules.

**12.1.6** Using precleaned (i.e., 10% diethyl ether/hexane Soxhlet extracted) cotton gloves, the filter/PUF cartridge is removed from the sealed container, the PUF removed from the glass cartridge, and the filter/PUF together are placed into the 300 mL Soxhlet extractor using prerinsed forceps.

**12.1.7** Before extraction begins, add  $100\ \mu\text{L}$  of the OCN solution directly to the top of the PUF plug.

*[Note: Incorporating a known concentration of the solution onto the sample provides a quality assurance check to determine recovery efficiency of the extraction and analytical processes.]*

**12.1.8** Connect the Soxhlet extractor to the 1,000 mL boiling flask and condenser. Wet the glass joints with 10% diethyl ether/hexane to ensure a tight seal between the fittings. If necessary, the PUF plug can be adjusted

using forceps to wedge it midway along the length of the siphon. The above procedure should be followed for all samples, with the inclusion of a blank control sample.

**12.1.9** The water flow to the condenser towers of the Soxhlet extraction assembly should be checked and the heating unit turned on. As the samples boil, the Soxhlet extractors should be inspected to ensure that they are filling and siphoning properly (4 to 6 cycles/hour). Samples should cycle for a minimum of 16 hours.

**12.1.10** At the end of the extracting process (minimum of 16 hours), the heating unit is turned off and the sample cooled to room temperature.

**12.1.11** The extracts are then concentrated to 5 mL using a Kuderna-Danish (K-D) apparatus. The K-D is set up, assembled with concentrator tubes, and rinsed. The lower end of the filter tube is packed with glass wool and filled with sodium sulfate to a depth of 40 mm. The filter tube is then placed in the neck of the K-D. The Soxhlet extractors and boiling flasks are carefully removed from the condenser towers and the remaining solvent is drained into each boiling flask. Sample extract is carefully poured through the filter tube into the K-D. Each boiling flask is rinsed three times by swirling hexane along the sides. Once the sample has drained, the filter tube is rinsed down with hexane. Each Snyder column is attached to the K-D and rinsed to wet the joint for a tight seal. The complete K-D apparatus is placed on a steam bath and the sample is evaporated to approximately 5 mL.

*[Note: Do not allow samples to evaporate to dryness.]*

Remove sample from the steam bath, rinse the Snyder column with a minimum of hexane, and allow to cool. Adjust sample volume to 10 mL in a concentrator tube, close with a glass stopper, and seal with TFE fluorocarbon tape. Alternatively, the sample may be quantitatively transferred (with concentrator tube rinsing) to prescored vials and brought up to final volume. Concentrated extracts are stored at  $<4^{\circ}\text{C}$  until analyzed. Analysis should occur no later than 40 days after sample extraction.

## 12.2 Sample Cleanup

**12.2.1** If only polar compounds are sought, an alumina cleanup procedure is appropriate. Before cleanup, the sample extract is carefully reduced to 1 mL using a gentle stream of clean nitrogen.

**12.2.2** A glass chromatographic column (2-mm I.D. x 15-cm long) is packed with alumina (7), activity grade IV, and rinsed with approximately 20 mL of n-hexane. The concentrated sample extract is placed on the column and eluted with 10 mL of n-hexane at a rate of 0.5 mL/minute. The eluate volume is adjusted to exactly 10 mL and analyzed as per Section 13.

**12.2.3** If both PCBs and common pesticides are sought, alternate cleanup procedures (8,9) may be required (i.e., silicic acid).

**12.2.4** Finally, class separation and improved specificity can be achieved by column clean-up and separation on Florisil (9).

### 13. Analytical Procedure

#### 13.1 Analysis of Organochlorine Pesticides by Capillary Gas Chromatography with Electron Capture Detector (GC/ECD)

*[Note: Organochlorine pesticides, PCBs and many nonchlorinated pesticides are responsive to electron capture detection (see Table 1). Most of these compounds can be analyzed at concentration of 1 to 50 ng/mL by GC/ECD. The following procedure is appropriate. Sampling and analytical methods that have been used to determine pesticides and PCBs collected from air using a modification of this methodology have been published (14-22).]*

**13.1.1** Select GC column (e.g., 0.3-mm by 30-m DB-5 column) and appropriate GC conditions to separate the target analytes. Typical operating parameters for this column with splitless injection are: Carrier gas-chromatography grade helium at a flow rate of 1 to 2 mL/min and a column head pressure of 7 to 9 psi (48 to 60 kPa); injector temperature of 250°C; detector temperature of 350°C; initial oven temperature of 50°C held for 2.0 min., ramped at 15°C/min to 150°C for 8 min, ramped at 10°C/min to 295°C then held for 5 min; purge time of 1.0 min. A typical injection volume is 2 to 3  $\mu$ L.

**13.1.2** Remove sample extract from refrigerator and allow to warm to room temperature.

**13.1.3** Prepare standard solution from reference materials of known purity. Analytically pure standards of organochlorine pesticides and PCBs are available from several commercial sources.

**13.1.4** Use the standard solutions of the various compounds of interest to determine relative retention times (RRTs) to an internal standard such as p,p'-DDE, aldrin or octachloronaphthalene. Use 1 to 3- $\mu$ L injections or other appropriate volumes.

**13.1.5** Determine detector linearity by injecting standard solutions of three different concentrations (amounts) that bracket the range of analyses. The calibration is considered linear if the relative standard deviation (RSD) of the three response factors for the three standards is 20 percent or less.

**13.1.6** Calibrate the system with a minimum of three levels of calibration standards in the linear range. The low standard should be near the analytical method detection limit. The calibration is considered linear if the relative standard deviation (RSD) of the three response factors for the three standards is 20 percent or less. The initial calibration should be verified by the analysis of a standard from an independent source. Recovery of 85 to 115 percent is acceptable. The initial calibration curve should be verified at the beginning of each day and after every ten samples by the analysis of the midpoint standard; an RPD of 15% or less is acceptable for continuing use of the initial calibration curve.

**13.1.7** Inject 1 to 3  $\mu$ L of sample extract. Record volume injected to the nearest 0.05  $\mu$ L.

**13.1.8** A typical ECD response for a mixture of single component pesticides using a capillary column is illustrated in Figure 12. If the response (peak height or area) exceeds the calibration range, dilute the extract and reanalyze.

**13.1.9** Quantify PCB mixtures by comparison of the total heights or areas of GC peaks (minimum of five) with the corresponding peaks in the best-matching standard. Use Aroclor 1242 for early-eluting PCBs and either Aroclor 1254 or Aroclor 1260 as appropriate for late-eluting PCBs.

**13.1.10** If both PCBs and organochlorine pesticides are present in the same sample, use column chromatographic separation on silicic acid (8,9) prior to GC analysis.

**13.1.11** If polar compounds are present that interfere with GC/ECD analysis, use column chromatographic cleanup or alumina (7), activity grade IV, in accordance with Section 12.2.

**13.1.12** For confirmation use a second GC column such as DB-608. All GC procedures except GC/MS require second column confirmation.

**13.1.13** For improved resolution use a capillary column such as an 0.25-mm I.D. x 30-m DB-5 with 0.25  $\mu$ m film thickness. The following conditions are appropriate.

- Helium carrier gas at 1 mL/min.
- Column temperature program, 90°C (4 min)/16°C/min to 154°C/4°C/min to 270°C.
- Detector,  $^{63}\text{Ni}$  ECD at 350°C.
- Make up gas, nitrogen, or 5% methane/95% argon at 60 mL/min.
- Splitless injection, 2  $\mu$ L maximum.
- Injector temperature, 220°C.

**13.1.14** Class separation and improved specificity can be achieved by column chromatographic separation on Florisil (9).

**13.1.15** A Hall electrolytic conductivity detector (HECD) operated in the reductive mode may be substituted for the ECD for improved specificity. Sensitivity, however, will be reduced by at least an order of magnitude.

### **13.2 Analysis of Organophosphorus Pesticides by Capillary Gas Chromatography with Flame Photometric or Nitrogen-Phosphorus Detectors (GC/FPD/NPD)**

*[Note: Organophosphorus pesticides are responsive to flame photometric and nitrogen-phosphorus (alkali flame ionization) detection. Most of these compounds can be analyzed at concentrations of 50 to 500 ng/mL using either of these detectors.]*

**13.2.1** Procedures given in Section 13.1.1 through 13.1.9 and Section 13.1.13 through 13.1.14 apply, except for the selection of surrogates.

**13.2.2** Use tributylphosphate, triphenylphosphate, or other suitable compound(s) as surrogates to verify extraction efficiency and to determine RRTs.

### **13.3 Analysis of Carbamate and Urea Pesticides by Capillary Gas Chromatography with Nitrogen-Phosphorus Detector**

**13.3.1** Trazine, carbamate, and urea pesticides may be determined by capillary GC (DB-5, DB-17, or DB-1701 stationary phase) using nitrogen-phosphorus detection or MS-SIM with detection limits in the 0.05 to 0.2  $\mu$ L/mL range. Procedures given in Section 13.1.1 through 13.1.9 and Section 13.1.13 through 13.1.14 apply, except for the selection of surrogates, detector, and make up gas.

**13.3.2** Thermal degradation may be minimized by reducing the injector temperature to 200°C. HPLC may also be used, but detection limits will be higher (1 to 5  $\mu$ g/mL).

**13.3.3** N-methyl carbamates may be determined using reverse-phase high performance liquid chromatography (HPLC) (C-18) (Section 13.4) and post-column derivization with o-phthaldehyde and fluorescence detection (EPA Method 531). Detection limits of 0.01 to 0.1  $\mu$ g/mL can be achieved.

### 13.4 Analysis of Carbamate, Urea, Pyrethroid, and Phenolic Pesticides by High Performance Liquid Chromatography (HPLC)

*[Note: Many carbamate pesticides, urea pesticides, pyrethrins, phenols, and other polar pesticides may be analyzed by high HPLC with fixed or variable wavelength UV detection. Either reversed-phase or normal phase chromatography may be used. Detection limits are 0.2 to 10 µg/mL of extract.]*

**13.4.1** Select HPLC column (i.e., Zorbax-SIL, 46-mm I.D. x 25-cm, or µ-Bondapak C18, 3.9-mm x 30-cm, or equivalent).

**13.4.2** Select solvent system (i.e., mixtures of methanol or acetonitrile with water or mixtures of heptane or hexane with isopropanol).

**13.4.3** Follow analytical procedures given in Sections 13.1.2 through 13.1.9.

**13.4.4** If interferences are present, adjust the HPLC solvent system composition or use column chromatographic clean-up with silica gel, alumina, or Florisil (9).

**13.4.5** An electrochemical detector may be used to improve sensitivity for some ureas, carbonates, and phenolics. Much more care is required in using this detector, particularly in removing dissolved oxygen from the mobile phase and sample extracts.

**13.4.6** Chlorophenol (di- through penta-) may be analyzed by GC/ECD or GC/MS after derivatization with pentafluorobenzylbromide (EPA Method 604).

**13.4.7** Chlorinated phenoxyacetic acid herbicides and pentachlorophenol can be analyzed by GC/ECD or GC/MS after derivatization with diazomethane (EPA Method 515). DB-5 and DBJ-1701 columns (0.25-mm I.D. x 30-m) at 60 to 300°C/4°C per min have been found to perform well.

### 13.5 Analysis of Pesticides and PCBs by Gas Chromatography with Mass Spectrometry Detection (GC/MS)

*[Note: A mass spectrometer operating in the selected ion monitoring mode is useful for confirmation and identification of pesticides.]*

**13.5.1** A mass spectrometer operating in select ion monitoring (SIM) mode can be used as a sensitive detector for multi-residue determination of a wide variety of pesticides. Mass spectrometers are now available that provide detection limits comparable to nitrogen-phosphorus and electron capture detectors.

**13.5.2** Most of the pesticides shown in Table 1 have been successfully determined by GC/MS-SIM. Typical GC operating parameters are as described in Section 13.1.1.

**13.5.3** The mass spectrometer is typically operated using positive ion electron impact ionization (70 eV). Other instrumental parameters are instrument specific.

**13.5.4** p-Terphenyl-d<sub>14</sub> is commonly used as a surrogate for GC/MS analysis.

**13.5.5** Quantification is typically performed using an internal standard method. 1,4-Dichlorobenzene, naphthalene-d<sub>8</sub>, acenaphthene-d<sub>10</sub>, phenanthrene-d<sub>10</sub>, chrysene-d<sub>12</sub> and perylene-d<sub>12</sub> are commonly used as internal standards. Procedures given in Section 13.1.1 through 13.1.9 and Section 13.1.13 through 13.1.14 apply, except for the selection of surrogates, detector, and make up gas.

**13.5.6** See ASTM Practice D 3687 for injection technique, determination of relative retention times, and other procedures pertinent to GC and HPLC analyses.

### 13.6 Sample Concentration

13.6.1 If concentrations are too low to detect by the analytical procedure of choice, the extract may be concentrated to 1 mL or 0.5 mL by carefully controlled evaporation under an inert atmosphere. The following procedure is appropriate.

13.6.2 Place K-D concentrator tube in a water bath and analytical evaporator (nitrogen blow-down) apparatus. The water bath temperature should be from 25°C to 50°C.

13.6.3 Adjust nitrogen flow through hypodermic needle to provide a gentle stream.

13.6.4 Carefully lower hypodermic needle into the concentrator tube to a distance of about 1 cm above the liquid level.

13.6.5 Continue to adjust needle placement as liquid level decreases.

13.6.6 Reduce volume to slightly below desired level.

13.6.7 Adjust to final volume by carefully rinsing needle tip and concentrator tube well with solvent (usually n-hexane).

## 14. Calculations

### 14.1 Determination of Concentration

14.1.1 The concentration of the analyte in the extract solution can be taken from a standard curve where peak height or area is plotted linearly against concentration in nanograms per milliliter (ng/mL). If the detector response is known to be linear, a single point is used as a calculation constant.

14.1.2 From the standard curve, determine the nanograms of analyte standard equivalent to the peak height or area for a particular compound.

14.1.3 Ascertain whether the field blank is contaminated. Blank levels should not exceed 10 ng/sample for organochlorine pesticides or 100 ng/sample for PCBs and other pesticides. If the blank has been contaminated, the sampling series must be held suspect.

### 14.2 Equations

14.2.1 Quantity of the compound in the sample (A) is calculated using the following equation:

$$A = 1000 \left( \frac{A_s \times V_e}{V_i} \right)$$

where:

A = total amount of analyte in the sample, ng.

A<sub>s</sub> = calculated amount of material injected onto the chromatograph based on calibration curve for injected standards, ng.

V<sub>e</sub> = final volume of extract, mL.

V<sub>i</sub> = volume of extract injected, μL.

1000 = factor for converting microliters to milliliters.

14.2.2 The extraction efficiency (EE) is determined from the recovery of surrogate spike as follows:

$$EE(\%) = \left| \frac{S}{S_a} \right| [100]$$

where:

EE = extraction efficiency, %

S = amount of spike recovered, ng.

S<sub>a</sub> = amount of spike added to plug, ng.

The extraction efficiency (surrogate recovery) must fall between 60-120% to be acceptable.

14.2.3 The total volume of air sampled under ambient conditions is determined using the following equation:

$$V_a = \frac{\sum_{i=1}^n (T_i \times F_i)}{1000 \text{ L/m}^3}$$

where:

V<sub>a</sub> = total volume of air sampled, m<sup>3</sup>.

T<sub>i</sub> = length of sampling segment between flow checks, min.

F<sub>i</sub> = average flow during sampling segment, L/min.

14.2.4 The air volume is corrected to EPA standard temperature (25°C) and standard pressure (760 mm Hg) as follows:

$$V_s = V_a \left( \frac{P_b - P_w}{760 \text{ mm Hg}} \right) \left( \frac{298K}{t_A} \right)$$

where:

V<sub>s</sub> = volume of air at standard conditions (25°C and 760 mm Hg), std. m<sup>3</sup>.

V<sub>a</sub> = total volume of air sampled, m<sup>3</sup>.

P<sub>b</sub> = average ambient barometric pressure, mm Hg.

P<sub>w</sub> = vapor pressure of water at calibration temperature, mm Hg.

t<sub>A</sub> = average ambient temperature, °C + 273.

14.2.5 If the proper criteria for a sample have been met, concentration of the compound in a standard cubic meter of air sampled is calculated as follows:

$$C_a(\text{ng/std. m}^3) = \left[ \frac{(A)}{(V_s)} \right]$$

If it is desired to convert the air concentration value to parts per trillion (ppt) in dry air at standard temperature and pressure (STP), the following conversion is used:

$$\text{ppt} = 0.844 (C_a)$$

The air concentration can be converted to parts per trillion (v/v) in air at STP as follows:

$$\text{pptv} = \left[ \frac{(24.45) (C_a)}{(\text{MW})} \right]$$

where:

MW = molecular weight of the compound of interest, g/g-mole.

**14.2.6** If quantification is performed using an internal standard, a relative response factor (RRF) is calculated by the equation:

$$\text{RRF} = \left[ \frac{(I_s)(C_{is})}{(I_{is})(C_s)} \right]$$

where:

$I_s$  = integrated area of the target analyte peak, counts.

$I_{is}$  = integrated area of the internal standard peak, counts.

$C_{is}$  = concentration of the internal standard, ng/ $\mu$ L.

$C_s$  = concentration of the analyte, ng/ $\mu$ L.

**14.2.7** The concentration of the analyte ( $C_a$ ) in the sample is then calculated as follows:

$$C_a = \frac{(I_s)(C_{is})}{(\text{RRF})(I_{is})}$$

where:

$I_s$  = integrated area of the target analyte peak, counts.

RRF = relative response factor (see Section 14.2.7).

## 15. Performance Criteria and Quality Assurance

*[Note: This section summarizes required quality assurance (QA) measures and provides guidance concerning performance criteria that should be achieved within each laboratory.]*

## 15.1 Standard Operating Procedures (SOPs)

**15.1.1** Users should generate SOPs describing the following activities accomplished in their laboratory: (1) assembly, calibration, and operation of the sampling system, with make and model of equipment used; (2) preparation, purification, storage, and handling of sampling cartridges; (3) assembly, calibration, and operation of the analytical system, with make and model of equipment used; and (4) all aspects of data recording and processing, including lists of computer hardware and software used.

**15.1.2** SOPs should provide specific stepwise instructions and should be readily available to, and understood by, the laboratory personnel conducting the work.

## 15.2 Process, Field, and Solvent Blanks

**15.2.1** One filter/PUF cartridge from each batch of approximately twenty should be analyzed, without shipment to the field, for the compounds of interest to serve as a process blank.

**15.2.2** During each sampling episode, at least one filter/PUF cartridge should be shipped to the field and returned, without drawing air through the sampler, to serve as a field blank.

**15.2.3** Before each sampling episode, one PUF plug from each batch of approximately twenty should be spiked with a known amount of the standard solution. The spiked plug will remain in a sealed container and will not be used during the sampling period. The spiked plug is extracted and analyzed with the other samples. This field spike acts as a quality assurance check to determine matrix spike recoveries and to indicate sample degradation.

**15.2.4** During the analysis of each batch of samples, at least one solvent process blank (all steps conducted but no filter/PUF cartridge included) should be carried through the procedure and analyzed.

**15.2.5** Levels for process, field and solvent blanks should not exceed 10 ng/sample for single components or 100 ng/sample for multiple component mixtures (i.e., for organochlorine pesticides and PCBs).

## 15.3 Method Precision and Bias

**15.3.1** Precision and bias in this type of analytical procedure are dependent upon the precision and bias of the analytical procedure for each compound of concern, and the precision and bias of the sampling process.

**15.3.2** Several different parameters involved in both the sampling and analysis steps of this method collectively determine the precision and bias with which each compound is detected. As the volume of air sampled is increased, the sensitivity of detection increases proportionately within limits set by: (a) the retention efficiency for each specific component trapped on the polyurethane foam plug, and (b) the background interference associated with the analysis of each specific component at a given site sampled. The sensitivity of detection of samples recovered by extraction depends on: (a) the inherent response of the particular GC detector used in the determinative step, and (b) the extent to which the sample is concentrated for analysis. It is the responsibility of the analyst(s) performing the sampling and analysis steps to adjust parameters so that the required detection limits can be obtained.

**15.3.3** The reproducibility of this method for most compounds for which it has been evaluated has been determined to range from  $\pm 5$  to  $\pm 30\%$  (measured as the relative standard deviation) when replicate sampling cartridges are used ( $N > 5$ ). Sample recoveries for individual compounds generally fall within the range of 90 to 110%, but recoveries ranging from 65 to 125% are considered acceptable.

## 15.4 Method Safety

15.4.1 This procedure may involve hazardous materials, operations, and equipment. This method does not purport to address all of the safety problems associated with its use.

15.4.2 It is the users responsibility to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to the implementation of this procedure. This should be part of the users SOP manual.

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TABLE 1. COMPOUNDS FOR WHICH PROCEDURE HAS BEEN TESTED<sup>1</sup>

Compound	Recommended Analysis <sup>2</sup>	Compound	Recommended Analysis
Alachlor	GC/ECD	Folpet	GC/ECD
Aldrin	GC/ECD	Heptachlor	GC/ECD
Allethrin	HPLC/UV	Heptachlor epoxide	GC/ECD
Aroclor 1242	GC/ECD	Hexachlorobenzene	GC/ECD
Aroclor 1254	GC/ECD	Lindane ( $\gamma$ -BHC)	GC/ECD
Aroclor 1260	GC/ECD	Linuron	HPLC/UV
Atrazine	GC/NPD	Malathion	GC/NPD or FPD
Bendiocarb	HPLC/UV	Methyl parathion	GC/NPD or FPD
BHC ( $\alpha$ - and $\beta$ -Hexachlorocyclohexanes)	GC/ECD	Methoxychlor	GC/FCD
Captan	GC/ECD	Metolachlor	GC/ECD
Carbaryl	HPLC/UV	Mexacarbate	GC/FCD
Carbofuran	HPLC/UV	Mirex	GC/ECD
Chlordane, technical	GC/ECD	Monuron	HPLC/UV
Chlorothalonil	GC/ECD	Trans-nonachlor	GC/ECD
Chlorotoluron	HPLC/UV	Oxychlordane	GC/ECD
Chlorpyrifos	GC/ECD	Pentachlorobenzene	GC/ECD
2,4-D esters and salts	GC/ECD	Pentachlorophenol	GC/ECD
Dacthal	GC/ECD	Permethrin (cis and trans)	HPLC/UV
<i>p,p'</i> -DDT	GC/ECD	<i>o</i> -Phenylphenol	HPLC/UV
<i>p,p'</i> -DDE	GC/ECD	Phorate	GC/NPD or FPD
Diazinon	GC/NPD or FPD	Propazine	GC/NPD
Dicloran	GC/ECD	Propoxur (Baygon)	HPLC/UV
Dieldrin	GC/ECD	Pyrethrin	HPLC/UV
Dicofol	GC/ECD	Resmethrin	HPLC/UV
Dicrotophos	HPLC/UV	Ronnel	GC/ECD
Diuron	HPLC/UV	Simazine	HPLC/UV
Ethyl parathion	GC/NPD or FPD	Terbutiuron	HPLC/UV
Fenvalerate	HPLC/UV	Trifluralin	GC/ECD
Fluometuron	HPLC/UV		

<sup>1</sup> The following recommendations are specific for that analyte for maximum sensitivity.

<sup>2</sup> GC = gas chromatography; ECD = electron capture detector; FPD = flame photometric detector; HPLC = high performance liquid chromatography; NPD = nitrogen-phosphorus detector; UV = ultraviolet absorption detector; GC/MS = gas chromatography/mass spectrometry may also be used.

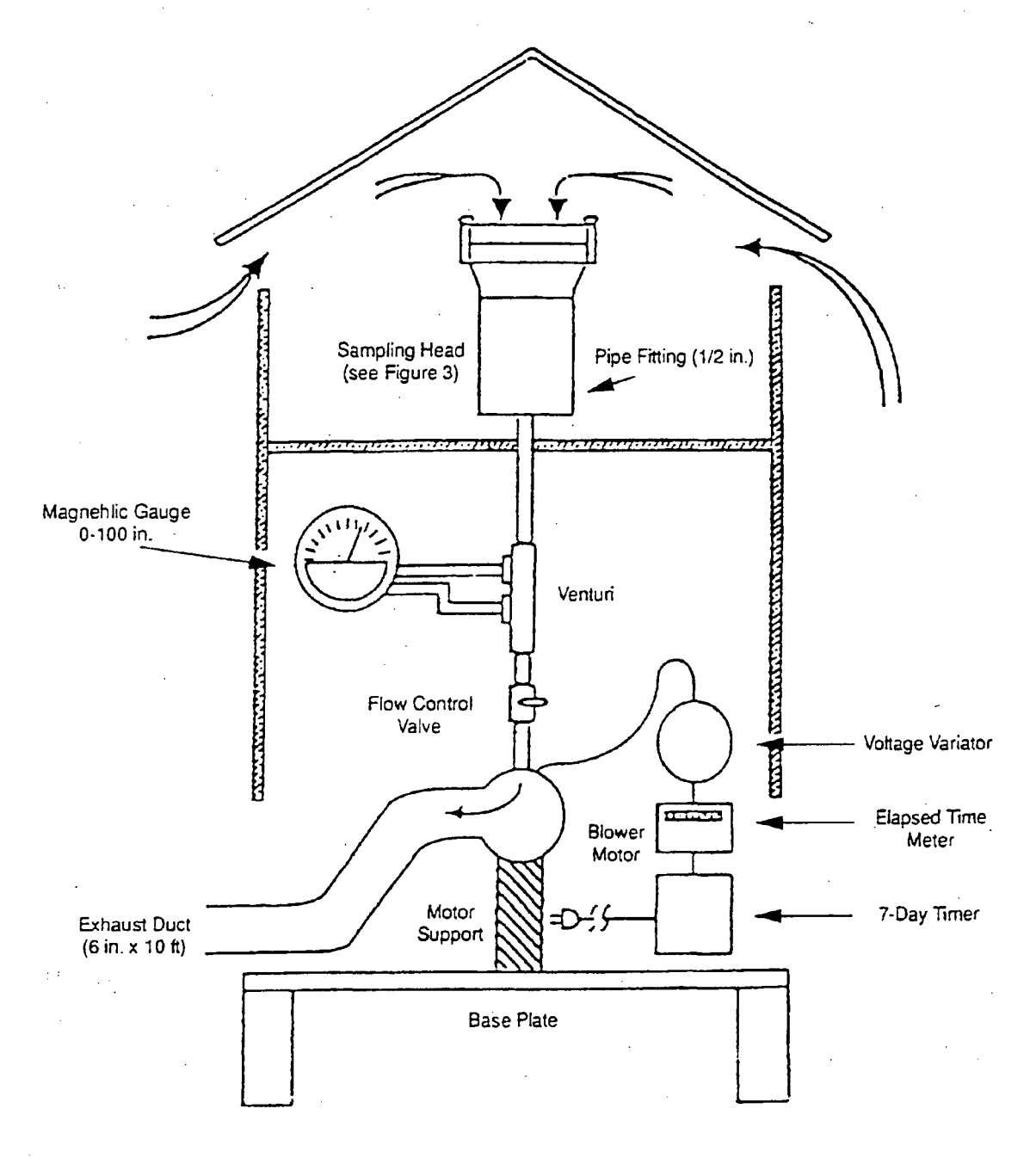


Figure 1. Typical high volume air sampler for monitoring common pesticides and PCBs.



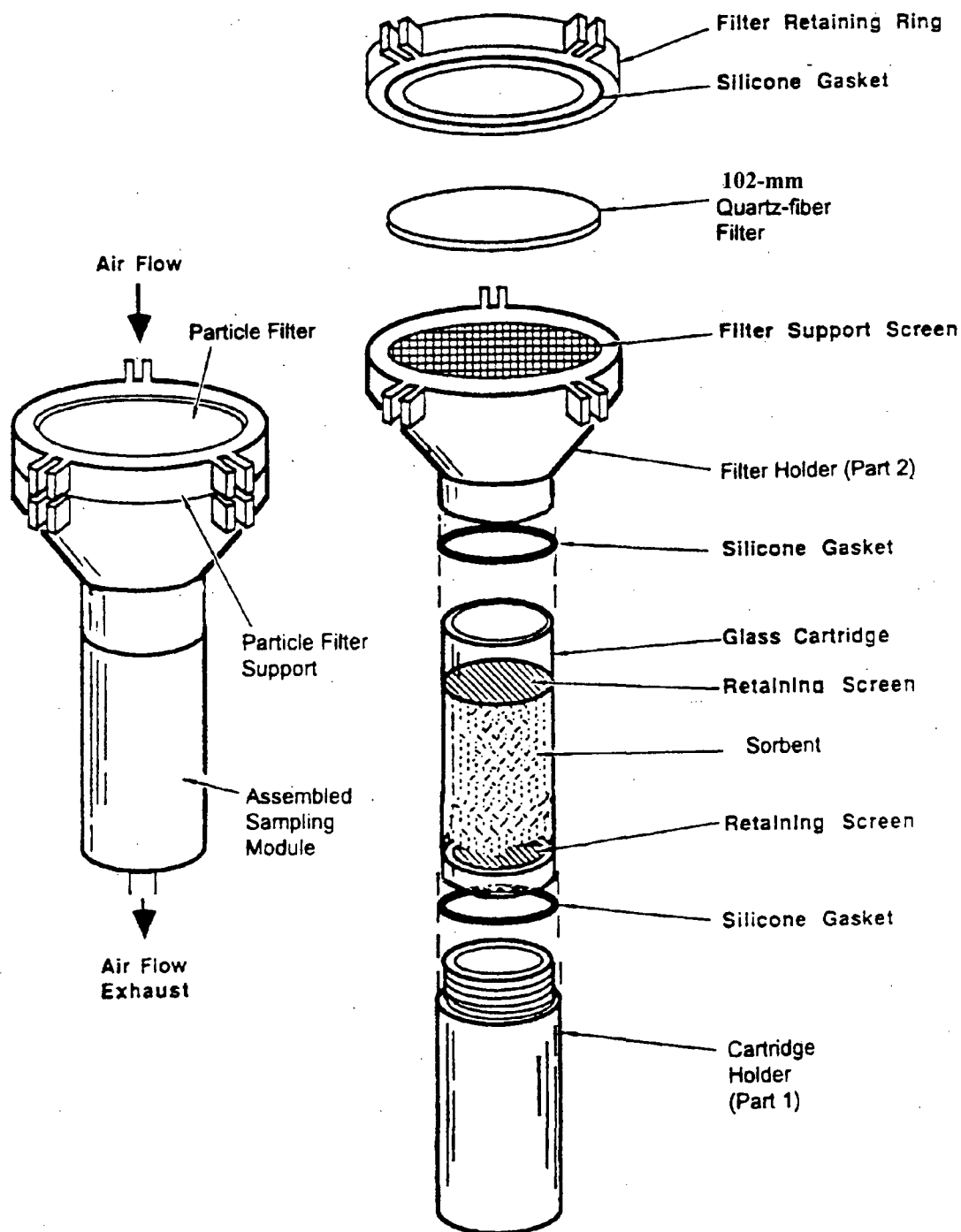


Figure 2. Typical absorbent cartridge assembly for sampling common pesticides and PCBs.

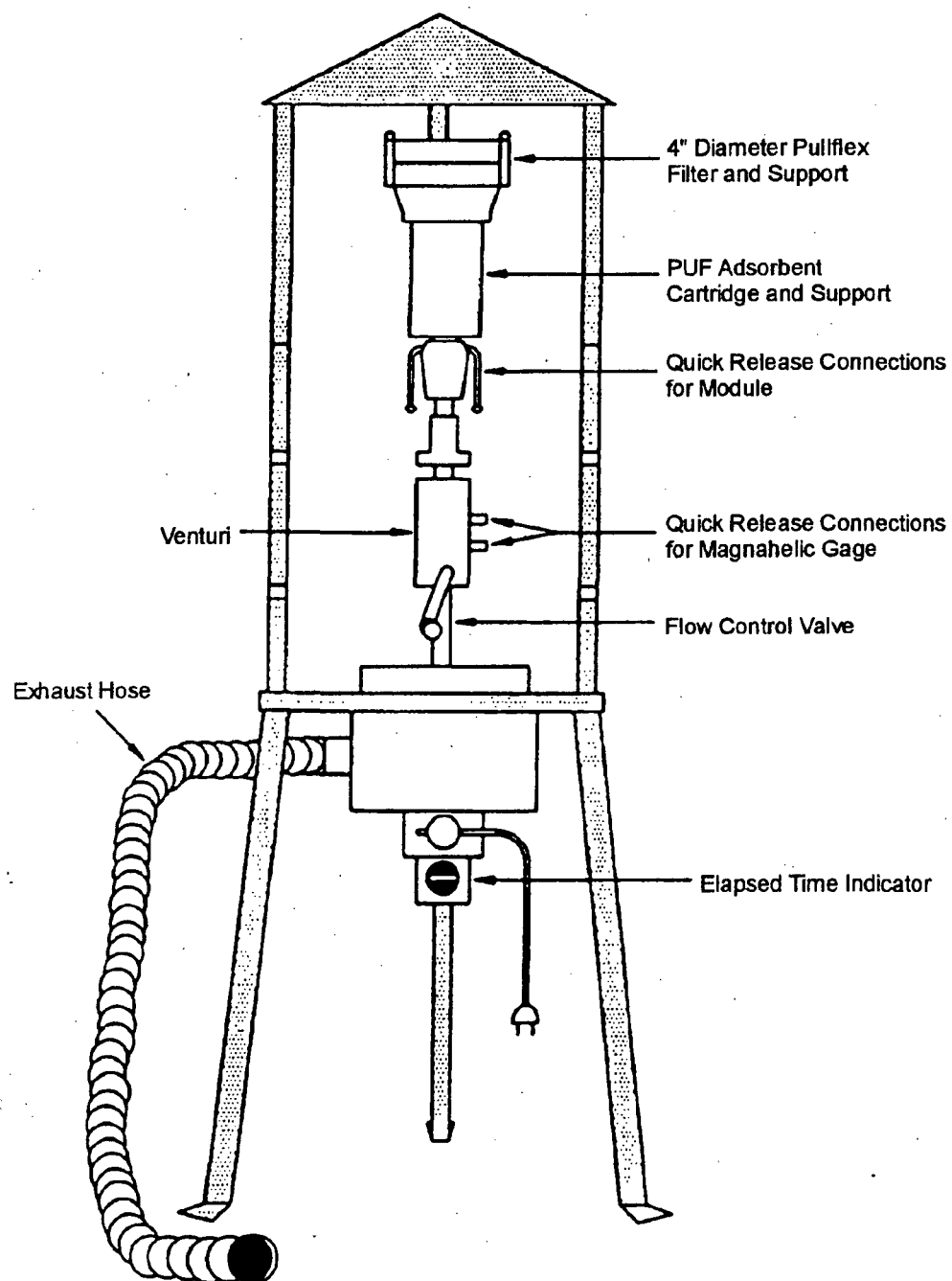
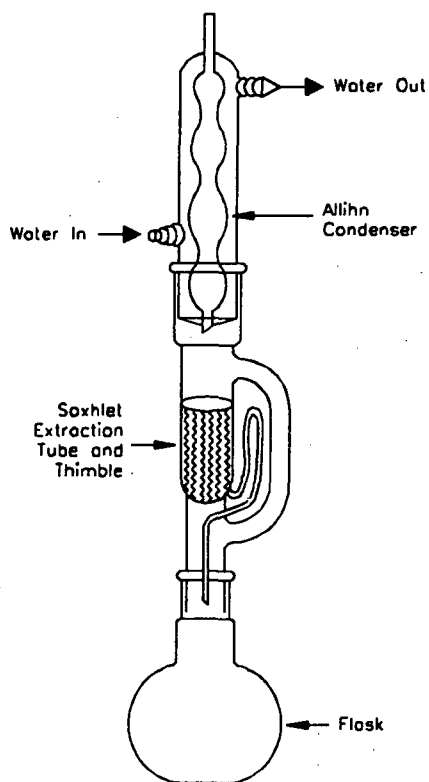
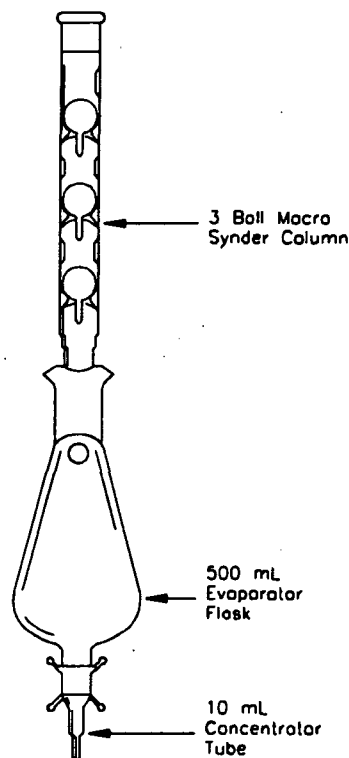


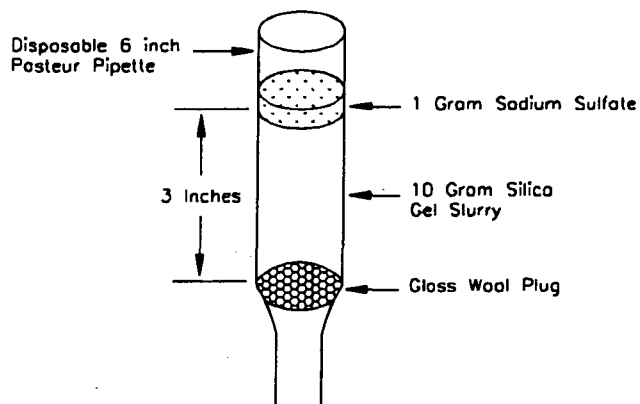
Figure 3. Portable high volume air sampler developed by EPA.



(a) Soxhlet Extraction Apparatus with Allihn Condenser

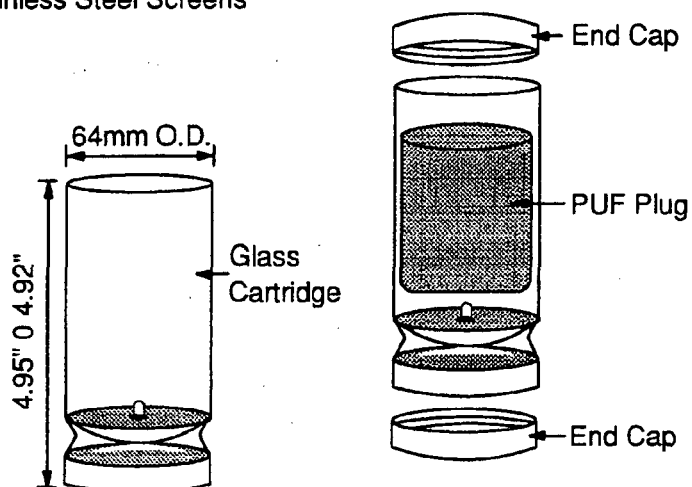


(b) Kuderna-Danish (K-D) Evaporator with Macro Synder Column

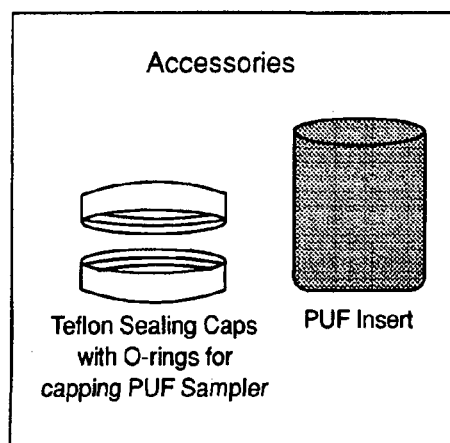


(c) Silica Gel Clean-up Column

Figure 4. Apparatus used for sample clean-up and extraction.

Glass PUF Cartridge with  
Stainless Steel Screens

5a. Glass PUF cartridge, plug, and end caps.



5b. PUF shipping container.

Figure 5. Glass PUF cartridge (5a) and shipping container (5b) for use with high-volume sampling systems.



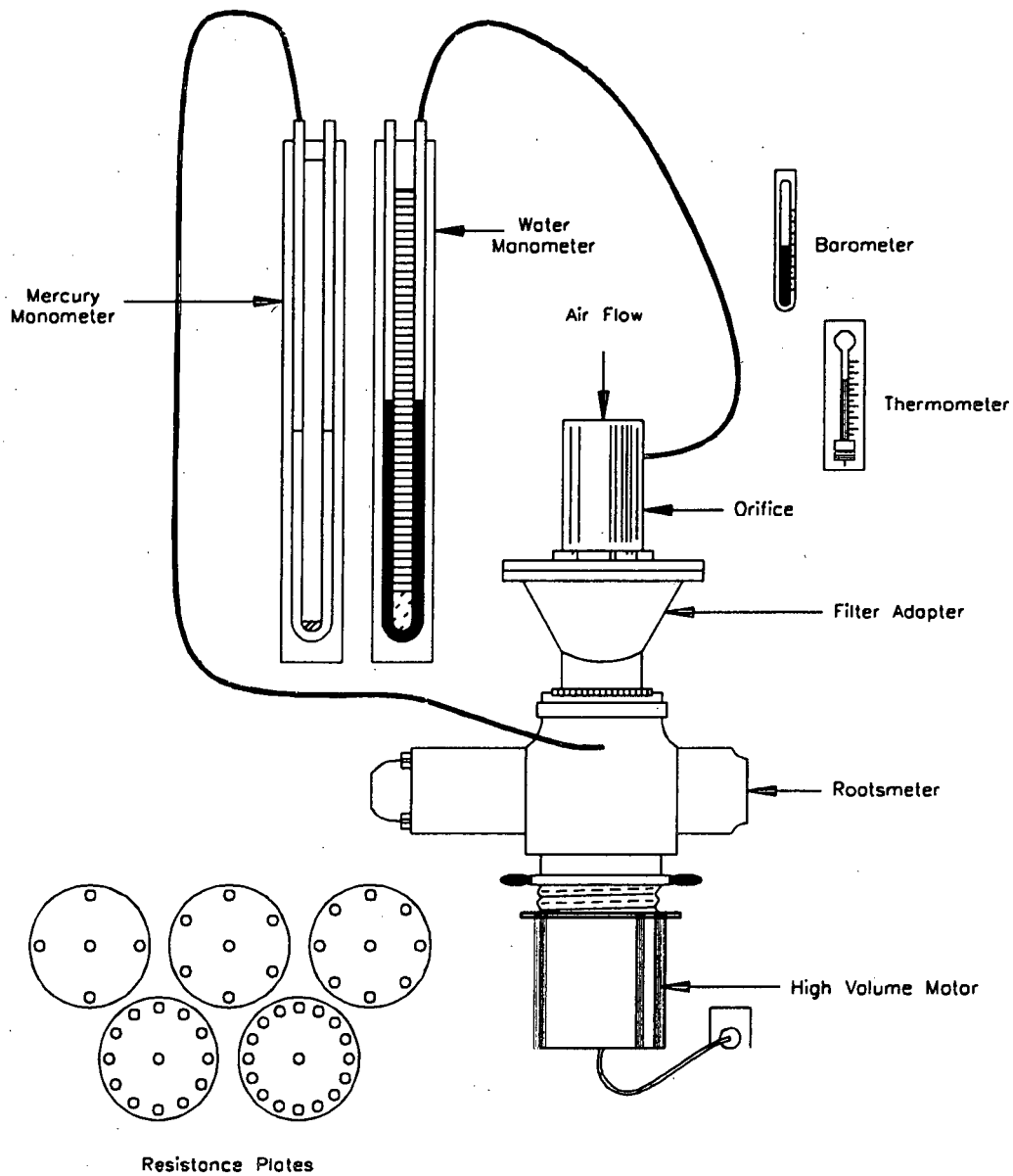


Figure 6. Positive displacement rootsmeter used to calibrate orifice transfer standard.

# COMPENDIUM METHOD TO-4A ORIFICE CALIBRATION DATA SHEET

T<sub>1</sub> \_\_\_\_\_

Name \_\_\_\_\_

P<sub>1</sub> \_\_\_\_\_ mmHg

Date \_\_\_\_\_

Orifice No. \_\_\_\_\_

Rootsmer No. \_\_\_\_\_

Resistance Plants (No. of holes)	Air Volume Measured by Rootsmer V <sub>m</sub>		Standard Volume, V <sub>std</sub> (std m <sup>3</sup> )	Time for Air Volume to Pass Through Rootsmer, θ (min)	Rootsmer Pressure Differential, ΔP (mm Hg)	Pressure Drop Across Orifice, ΔH (in. H <sub>2</sub> O)	x-Axis Standard Flowrate, Q <sub>std</sub> (std m <sup>3</sup> /min)	Y - axis $\sqrt{\Delta H(P_1/P_{std})(298/T_1)}$ value
	(R <sup>3</sup> )	(m <sup>3</sup> )						
5	200	5.66						
7	200	5.66						
10	300	8.50						
13	300	8.50						
18	300	8.50						

Factors: (R<sup>3</sup>)(0.02832  $\frac{m^3}{R^3}$ ) = m<sup>3</sup> and (in. Hg) 25.4 ( $\frac{mm\ Hg}{in.\ Hg}$ ) = mm Hg

Calculation Equations:

$$1. \quad V_{std} = V_m \left( \frac{P_1 - \Delta P}{P_{std}} \right) \left( \frac{T_{std}}{T_1} \right)$$

where:

$$T_{std} = 296^\circ K$$

$$P_{std} = 760.0\ mm\ Hg$$

$$2. \quad Q_{std} = \frac{V_{std}}{\theta}$$

Figure 7. Orifice calibration data sheet.

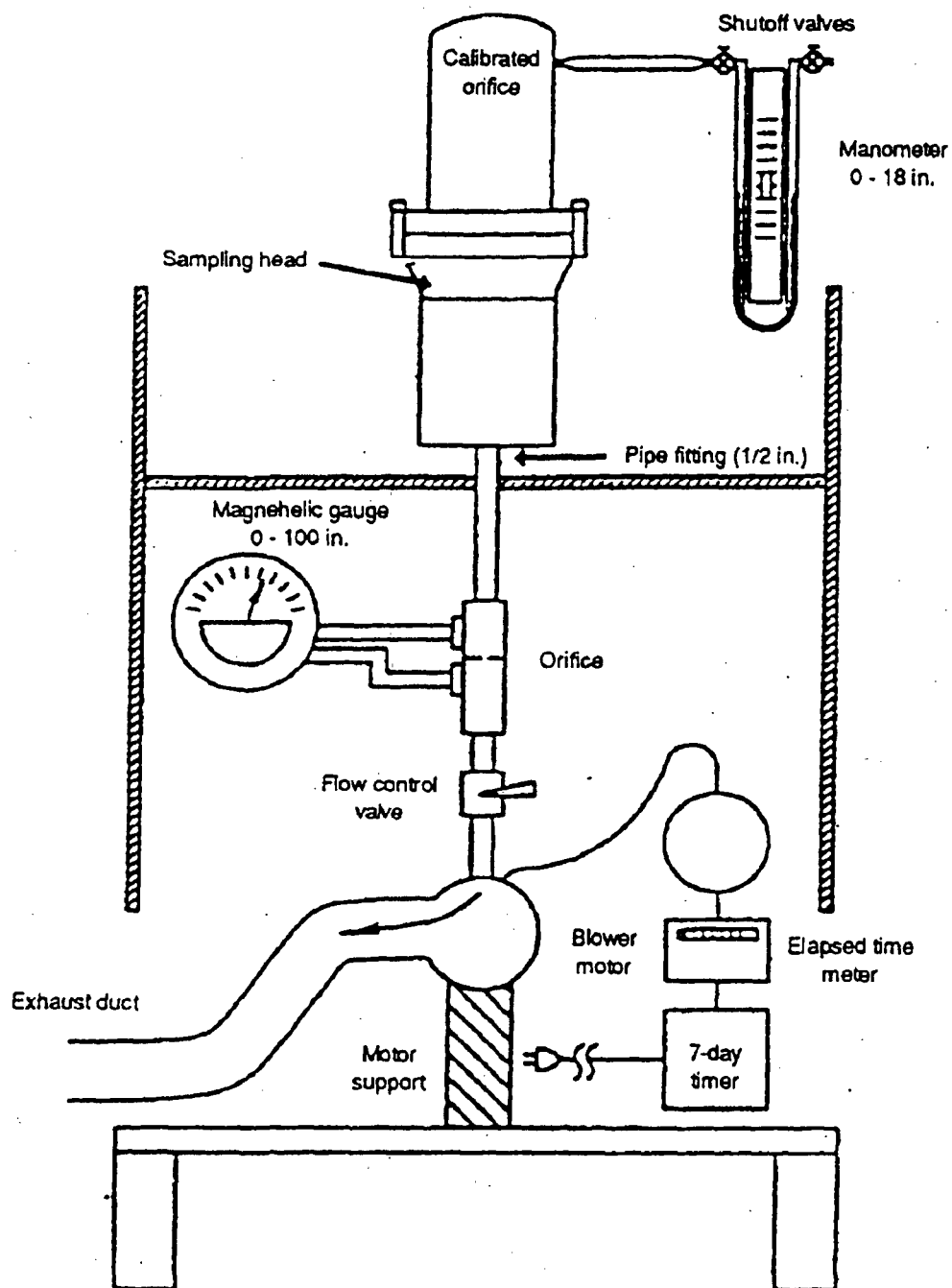


Figure 8. Field calibration configuration of the high-volume sampler for common pesticides and PCBs.



COMPENDIUM METHOD TO-4A  
FIELD CALIBRATION DATA SHEET FOR SAMPLER CALIBRATION

Sampler ID:

Calibration Orifice ID:

Sampler Location:

Job No.:

High Volume Transfer Orifice Data:

Correlation Coefficient (CC1):

Slope (M1):

(CC2):

(M2):

Intercept (B1):

(B2):

Calibration Date: \_\_\_\_ Time:

Calibration Ambient Temperature: \_\_\_\_ °F \_\_\_\_ °C

CALIBRATOR'S SIGNATURE

Calibration Ambient Barometric Pressure: \_\_\_\_ "Hg \_\_\_\_ mm Hg

Calibration set point (SP): \_\_\_\_\_

SAMPLER CALIBRATION

Actual values from calibration		Calibrated values		
Orifice manometer, inches (Y1)	Monitor Magnehelic, inches (Y2)	Orifice manometer (Y3)	Monitor Magnehelic (Y4)	Calculated value orifice flow, scm (X1)
	70			
	60			
	50			
	40			
	30			
	20			
	10			

Definitions

Y1 = Calibration orifice reading, in. H<sub>2</sub>OY2 = Monitor Magnehelic reading, in. H<sub>2</sub>OP<sub>a</sub> = Barometric pressure actual, mm Hg

B1 = Manufacturer's Calibration orifice Intercept

M1 = Manufacturer's Calibration orifice manometer slope

Y3 = Calculated value for orifice manometer  
=  $[Y1(P_a/760)(298/\{T_a + 273\})]^{1/2}$ 

Y4 = Calculated value for Magnehelic

=  $[Y2(P_a/760)(298/\{T_a + 273\})]^{1/2}$ 

X1 = Calculated value orifice flow, scm

=  $\frac{Y3 - B1}{M1}$ P<sub>std</sub> = Barometric pressure standard, 760 mm HgT<sub>a</sub> = Temperature actual, °CT<sub>std</sub> = Temperature standard, 25 °C

Figure 9. Orifice transfer standard field calibration data sheet.

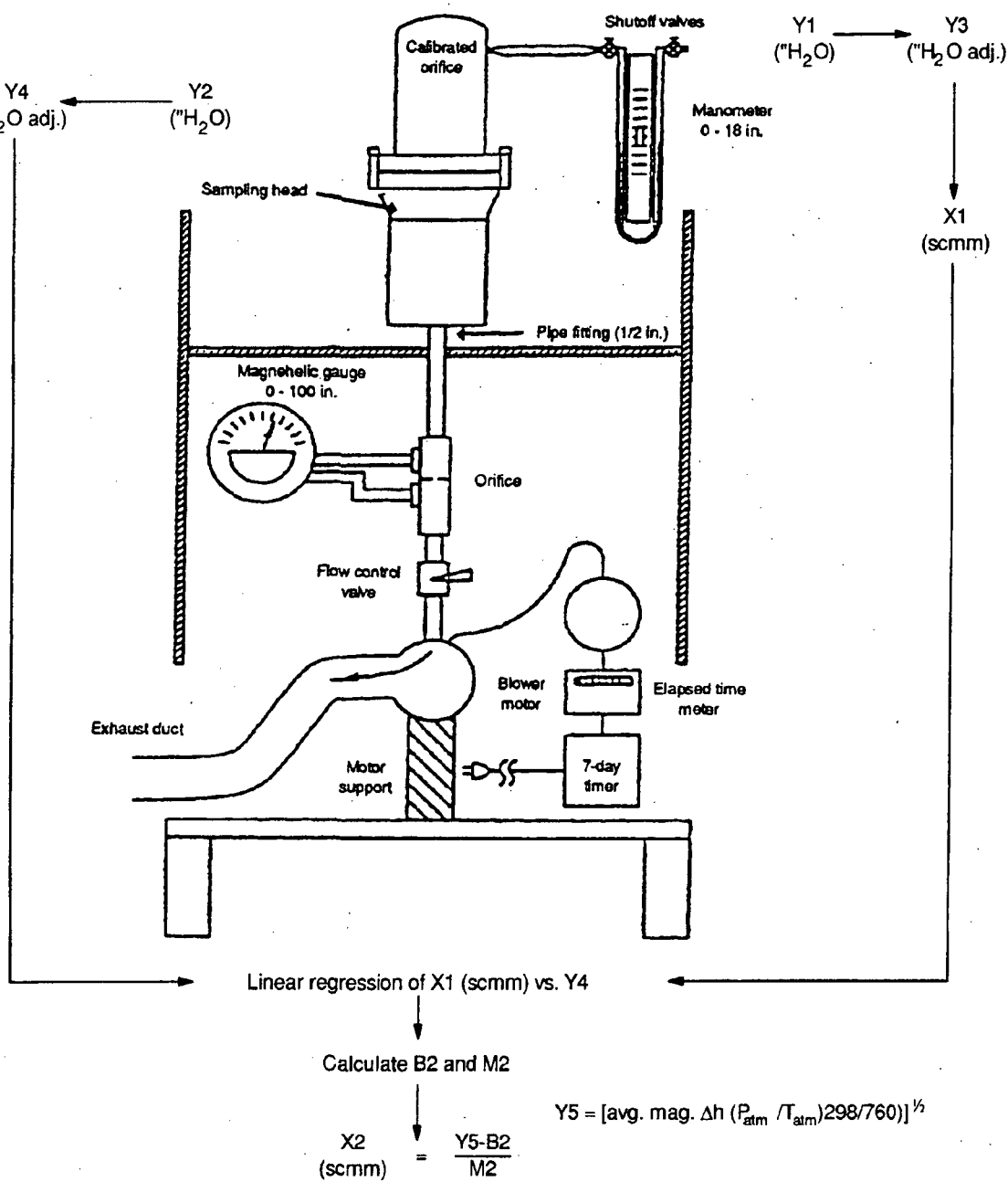


Figure 10. Relationship between orifice transfer standard and flow rate through sampler.

# COMPENDIUM METHOD TO-4A

## FIELD TEST DATA SHEET

### GENERAL INFORMATION

**Sampler I.D. No.:** \_\_\_\_\_  
**Lab PUF Sample No.:** \_\_\_\_\_  
**Sample location:** \_\_\_\_\_  
 \_\_\_\_\_

Operator: \_\_\_\_\_  
Other: \_\_\_\_\_  
\_\_\_\_\_

**PUF Cartridge Certification Date:** \_\_\_\_\_  
**Date/Time PUF Cartridge Installed:** \_\_\_\_\_  
**Elapsed Timer:** \_\_\_\_\_  
     **Start** \_\_\_\_\_  
     **Stop** \_\_\_\_\_  
     **Diff.** \_\_\_\_\_  
**Sampling**

	<b>Start</b>	<b>Stop</b>
<b>Barometric pressure ("Hg)</b>	_____	_____
<b>Ambient Temperature (°F)</b>	_____	_____
<b>Rain</b>	<b>Yes</b> _____	<b>Yes</b> _____
	<b>No</b> _____	<b>No</b> _____

**Sampling time**  
**Start** \_\_\_\_\_  
**Stop** \_\_\_\_\_  
**Diff.** \_\_\_\_\_

**M1** \_\_\_\_\_ **B1** \_\_\_\_\_  
**M2** \_\_\_\_\_ **B2** \_\_\_\_\_

**Audit flow check within  $\pm 10$  of set point**  
 \_\_\_\_\_ Yes  
 \_\_\_\_\_ No

TIME	TEMP	BAROMETRIC PRESSURE	MAGNEHELIC READING	CALCULATED FLOW RATE (scmm)	READ BY.
Avg.					

### Comments

Figure 11. Field test data sheet.



**OPERATING CONDITIONS**

Column Type: DB-5 0.32 capillary,  
0.25  $\mu$ m film thickness

Column Temperature Program: 90°C(4min)/16°C per min to  
154°C/4°C per min to 270°C.

Detector: Electron Capture

Carrier Gas: Helium at 1 mL/min.

Make Up Gas: 5% Methane/95% Argon at 60 mL/min.

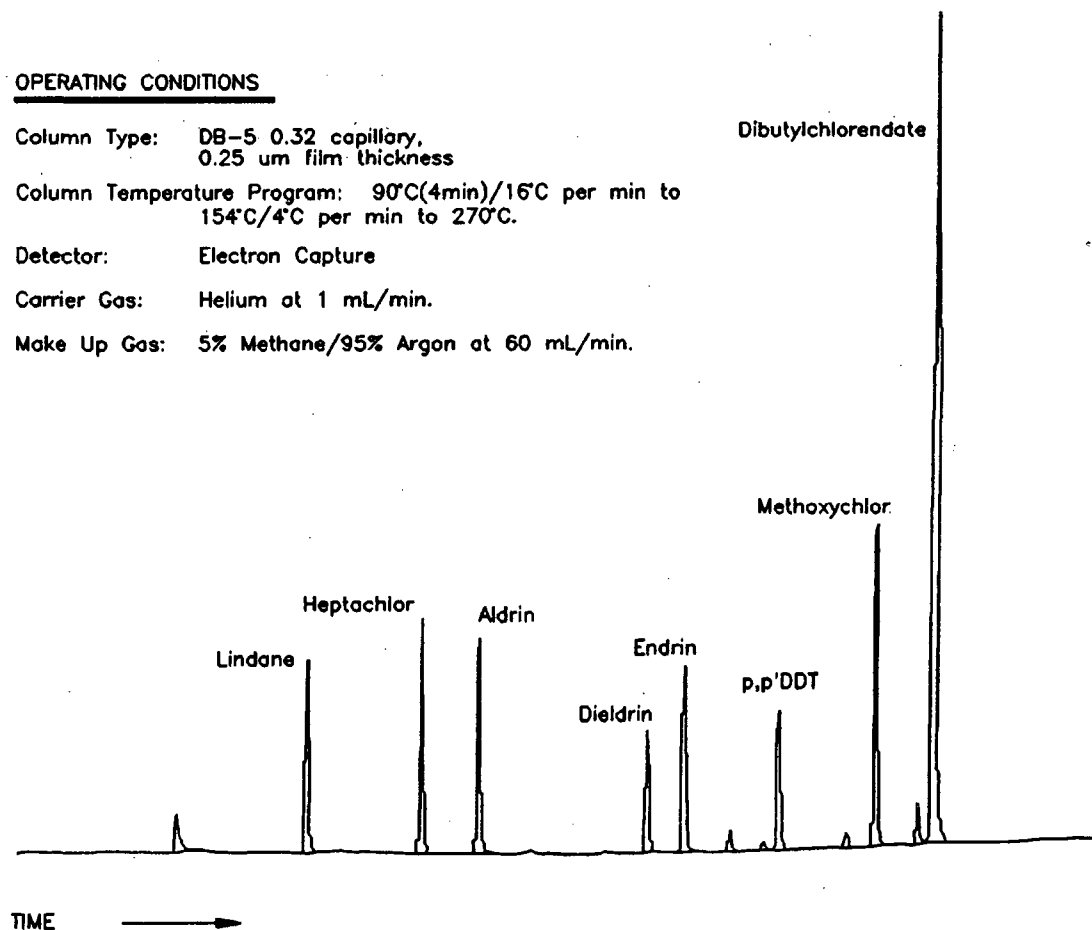


Figure 12. Chromatogram showing a mixture of single component pesticides determined by GC/ECD using a capillary column.



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**Compendium of Methods  
for the Determination of  
Toxic Organic Compounds  
in Ambient Air**

**Second Edition**

**Compendium Method TO-10A**

**Determination Of Pesticides And  
Polychlorinated Biphenyls In Ambient  
Air Using Low Volume Polyurethane  
Foam (PUF) Sampling Followed By  
Gas Chromatographic/Multi-Detector  
Detection (GC/MD)**

**Center for Environmental Research Information  
Office of Research and Development  
U.S. Environmental Protection Agency  
Cincinnati, OH 45268**

**January 1999**

## Method TO-10A

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Method TO-10 was originally published in March of 1989 as one of a series of peer reviewed methods in the second supplement to "*Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*," EPA 600/4-89-018. In an effort to keep these methods consistent with current technology, Method TO-10 has been revised and updated as Method TO-10A in this Compendium to incorporate new or improved sampling and analytical technologies. In addition, this method incorporates ASTM Method D 4861-94, *Standard Practice for Sampling and Analysis of Pesticides and Polychlorinated Biphenyls in Air*.

This Method is the result of the efforts of many individuals. Gratitude goes to each person involved in the preparation and review of this methodology.

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#### DISCLAIMER

*This Compendium has been subjected to the Agency's peer and administrative review, and it has been approved for publication as an EPA document. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.*

## METHOD TO-10A

### Determination Of Pesticides And Polychlorinated Biphenyls In Ambient Air Using Low Volume Polyurethane Foam (PUF) Sampling Followed By Gas Chromatographic/Multi-Detector Detection (GC/MD)

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## METHOD TO-10A

### Determination Of Pesticides And Polychlorinated Biphenyls In Ambient Air Using Low Volume Polyurethane Foam (PUF) Sampling Followed By Gas Chromatographic/Multi-Detector (GC/MD) Detection

#### 1. Scope

1.1 This document describes a method for sampling and analysis of a variety of common pesticides and for polychlorinated biphenyls (PCBs) in ambient air. The procedure is based on the adsorption of chemicals from ambient air on polyurethane foam (PUF) or a combination of PUF and granular sorbent using a low volume sampler.

1.2 The low volume PUF sampling procedure is applicable to multicomponent atmospheres containing common pesticide concentrations from 0.001 to 50  $\mu\text{g}/\text{m}^3$  over 4- to 24-hour sampling periods. The limits of detection will depend on the nature of the analyte and the length of the sampling period.

1.3 Specific compounds for which the method has been employed are listed in Table 1. The analytical methodology described in Compendium Method TO-10A is currently employed by laboratories throughout the U.S. The sampling methodology has been formulated to meet the needs of common pesticide and PCB sampling in ambient air.

1.4 Compendium Method TO-10 was originally published in 1989. The method was further modified for indoor air application in 1990. In an effort to keep the method consistent with current technology, Compendium Method TO-10 has incorporated ASTM Method D4861-94 (1) and is published here as Compendium Method TO-10A.

#### 2. Summary of Method

2.1 A low-volume (1 to 5 L/minute) sample is used to collect vapors on a sorbent cartridge containing PUF or PUF in combination with another solid sorbent. Airborne particles may also be collected, but the sampling efficiency is not known (2).

2.2 Pesticides and other chemicals are extracted from the sorbent cartridge with 5 percent diethyl ether in hexane and determined by gas chromatography coupled with an electron capture detector (ECD), nitrogen-phosphorus detector (NPD), flame photometric detector (FPD), Hall electrolytic conductivity detector (HECD), or a mass spectrometer (MS). For common pesticides, high performance liquid chromatography (HPLC) coupled with an ultraviolet (UV) detector or electrochemical detector may be preferable. This method describes the use of an electron capture detector.

2.3 Interferences resulting from analytes having similar retention times during GC analysis are resolved by improving the resolution or separation, such as by changing the chromatographic column or operating parameters, or by fractionating the sample by column chromatography.

### 3. Significance

3.1 Pesticide usage and environmental distribution are common to rural and urban areas of the United States. The application of pesticides can cause potential adverse health effects to humans by contaminating soil, water, air, plants, and animal life. However, human exposure to PCBs continues to be a problem because of their presence in the environment.

3.2 Many pesticides and PCBs exhibit bioaccumulative, chronic health effects; therefore, monitoring the presence of these compounds in ambient air is of great importance.

3.3 Use of a portable, low volume PUF sampling system allows the user flexibility in locating the apparatus. The user can place the apparatus in a stationary or mobile location. The portable sampling apparatus may be positioned in a vertical or horizontal stationary location (if necessary, accompanied with supporting structure). Mobile positioning of the system can be accomplished by attaching the apparatus to a person to test air in the individual's breathing zone.

3.4 Moreover, this method has been successfully applied to measurement of common pesticides in outdoor air, indoor air and for personal respiratory exposure monitoring (3).

### 4. Applicable Documents

#### 4.1 ASTM Standards

- D1356 *Definition of Terms Relating to Atmospheric Sampling and Analysis*
- D4861-94 *Standard Practice for Sampling and Analysis of Pesticides and Polychlorinated Biphenyls in Air*
- E260 *Recommended Practice for General Gas Chromatography Procedures*
- E355 *Practice for Gas Chromatography Terms and Relationships*
- D3686 *Practice for Sampling Atmospheres to Collect Organic Compound Vapors (Activated Charcoal Tube Adsorption Method)*
- D3687 *Practice for Analysis of Organic Compound Vapors Collected by the Activated Charcoal Tube Adsorption*
- D4185 *Practice for Measurement of Metals in Workplace Atmosphere by Atomic Absorption Spectrophotometry*

#### 4.2 EPA Documents

- *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air: Method TO-10, Second Supplement*, U. S. Environmental Protection Agency, EPA 600/4-89-018, March 1989.
- *Manual of Analytical Methods for Determination of Pesticides in Humans and Environmental Standards*, U. S. Environmental Protection Agency, EPA 600/8-80-038, June 1980.
- *Compendium of Methods for the Determination of Air Pollutants in Indoor Air: Method IP-8*, U. S. Environmental Protection Agency, EPA 600/4-90-010, May 1990.

### 4.3 Other Documents

- Code of Federal Regulations, Title 40, Part 136, Method 604

### 5. Definitions

*[Note: Definitions used in this document and in any user-prepared Standard operating procedures (SOPs) should be consistent with ASTM D1356, E260, and E355. All abbreviations and symbols are defined within this document at point of use.]*

**5.1 Sampling efficiency (SE)**-ability of the sampling medium to trap analytes of interest. The percentage of the analyte of interest collected and retained by the sampling medium when it is introduced as a vapor in air or nitrogen into the air sampler and the sampler is operated under normal conditions for a period of time equal to or greater than that required for the intended use is indicated by %SE.

**5.2 Retention efficiency (RE)**-ability of sampling medium to retain a compound added (spiked) to it in liquid solution.

**5.3 Static retention efficiency**-ability of the sampling medium to retain the solution spike when the sample cartridge is stored under clean, quiescent conditions for the duration of the test period.

**5.4 Dynamic retention efficiency (RE<sub>d</sub>)**-ability of the sampling medium to retain the solution spike when air or nitrogen is drawn through the sampling cartridge under normal operating conditions for the duration of the test period. The dynamic RE is normally equal to or less than the SE.

**5.5 Retention time (RT)**-time to elute a specific chemical from a chromatographic column, for a specific carrier gas flow rate, measured from the time the chemical is injected into the gas stream until it appears at the detector.

**5.6 Relative retention time (RRT)**-a ratio of RTs for two chemicals for the same chromatographic column and carrier gas flow rate, where the denominator represents a reference chemical.

**5.7 Surrogate standard**-a chemically inert compound (not expected to occur in the environmental sample) that is added to each sample, blank, and matrix-spiked sample before extraction and analysis. The recovery of the surrogate standard is used to monitor unusual matrix effects, gross sample processing errors, etc. Surrogate recovery is evaluated for acceptance by determining whether the measured concentration falls within acceptable limits.

### 6. Interferences

**6.1** Any gas or liquid chromatographic separation of complex mixtures of organic chemicals is subject to serious interference problems due to coelution of two or more compounds. The use of capillary or microbore columns with superior resolution or two or more columns of different polarity will frequently eliminate these problems. In addition, selectivity may be further enhanced by use of a MS operated in the selected ion monitoring (SIM) mode as the GC detector. In this mode, co-eluting compounds can often be determined.

**6.2** The ECD responds to a wide variety of organic compounds. It is likely that such compounds will be encountered as interferences during GC/ECD analysis. The NPD, FPD, and HECD detectors are element specific, but are still subject to interferences. UV detectors for HPLC are nearly universal, and the electrochemical detector may also respond to a variety of chemicals. Mass spectrometric analyses will generally provide positive identification of specific compounds.

**6.3** PCBs and certain organochlorine pesticides (e.g., chlordane) are complex mixtures of individual compounds which can cause difficulty in accurately quantifying a particular formulation in a multiple component mixture. PCBs may interfere with the determination of pesticides.

**6.4** Contamination of glassware and sampling apparatus with traces of pesticides or PCBs can be a major source of error, particularly at lower analyte concentrations. Careful attention to cleaning and handling procedures is required during all steps of sampling and analysis to minimize this source of error.

**6.5** The general approaches listed below should be followed to minimize interferences.

**6.5.1** Polar compounds, including certain pesticides (e.g., organophosphorus and carbamate classes) can be removed by column chromatography on alumina. Alumina clean-up will permit analysis of most organochlorine pesticides and PCBs (4).

**6.5.2** PCBs may be separated from other organochlorine pesticides by column chromatography on silicic acid (5,6).

**6.5.3** Many pesticides can be fractionated into groups by column chromatography on Florisil (6).

## **7. Equipment and Materials**

### **7.1 Materials for Sample Collection**

**7.1.1 Continuous-Flow Sampling Pump (see Figure 1).** The pump should provide a constant air flow ( $\leq \pm 5\%$ ), be quiet and unobtrusive, with a flow rate of 1 to 5 L/min. Sources of equipment are Supelco, Supelco Park, Bellefonte, PA; SKC, 334 Valley View Road, Eighty Four, PA and other manufacturers.

**7.1.2 Sampling Cartridge (see Figure 2).** Constructed from a 20-mm (I.D.) x 10-cm borosilicate glass tube drawn down to a 7-mm (O.D.) open connection for attachment to the pump by way of flexible tubing (see Figure 1).

**7.1.3 Sorbent, Polyurethane Foam (PUF).** Cut into a cylinder, 22-mm I.D. and 7.6-cm long, fitted under slight compression inside the cartridge. The PUF should be of the polyether type, (density of 0.0225 g/cm<sup>3</sup>). This is the type of foam used for furniture upholstery, pillows, and mattresses. The PUF cylinders (plugs) should be slightly larger in diameter than the internal diameter of the cartridge. The PUF sorbent may be cut by one of the following means:

- With a high-speed cutting tool, such as a motorized cork borer. Distilled water should be used to lubricate the cutting tool.
- With a hot wire cutter. Care should be exercised to prevent thermal degradation of the foam.
- With scissors, while plugs are compressed between the 22-mm circular templates.

Alternatively, pre-extracted PUF plugs and glass cartridges may be obtained commercially.

**7.1.4 Particle Filter.** The collection efficiency of PUF for small-diameter (0.1 to 1  $\mu\text{m}$ ) airborne particles is only about 20% (7). However, most pesticides and PCBs exist in air under steady-state conditions primarily as vapors (8). Most particulate-associated pesticides or PCBs, if any, will also tend to be vaporized from filters after collection (9). Collocated sampling with and without a quartz-fiber pre-filter has yielded indistinguishable results for a broad spectrum of pesticides and PCBs found in indoor air (10).

**7.1.4.1** An open-face filter may be attached to the sampling cartridge by means of a union for 1-in. (25.4-mm) tubing.

**7.1.4.2** A 32-mm diameter quartz microfiber filter (e.g., Paliflex® type 2500 QAT-UP) is placed in the open end of the union and supported by means of a screen or perforated metal plate [e.g., a 304-stainless steel disk, 0.0312-in. (0.8-mm) thick with 1/16-in. (1.6-mm) diameter round perforations at 132 holes per in.<sup>2</sup> (20 holes/cm<sup>2</sup>), 41% open area.]. A 32-mm Viton® O-ring is placed between the filter and outer nut to effect a seal (see Figure 3). This filter holder is available from Supelco Park, Bellefonte, PA; SKC, 334 Forty Eight, PA; and other manufacturers.

**7.1.5 Size-Selective Impactor Inlet.** A size-selective impactor inlet with an average particle-size cut-point of 2.5  $\mu\text{m}$  or 10  $\mu\text{m}$  mean diameter at a sampling rate of 4 L/min may be used to exclude nonrespirable airborne particulate matter (11). This inlet, particle filter support, sampling cartridge holders are available commercially from Supelco, Supelco Park, Bellefonte, PA; SKC, 334 Forty Eight, PA and University Research Glassware (URG), Chapel Hill, NC.

**7.1.6 Tenax-TA.** 60/80 mesh, 2,6-diphenylphenylene oxide polymer. Commercially available from Supelco, Supelco Park, Bellefonte, PA and SKC, 334 Forty Eight, PA.

## 7.2 Equipment for Analysis

**7.2.1 Gas Chromatograph (GC).** The GC system should be equipped with appropriate detector(s) and either an isothermally controlled or temperature programmed heating oven. Improved detection limits may be obtained with a GC equipped with a cool on-column or splitless injector.

**7.2.2 Gas Chromatographic Column.** As an example, a 0.32 mm (I.D.) x 30 m DB-5, DB-17, DB-608, and DB-1701 are available. Other columns may also provide acceptable results.

**7.2.3 HPLC Column.** As an example, a 4.6-mm x 25-cm Zorbax SIL or  $\mu$ Bondpak C-18. Other columns may also provide acceptable results.

**7.2.4 Microsyringes.** 5  $\mu\text{L}$  volume or other appropriate sizes.

## 7.3 Reagents and Other Materials

**7.3.1 Round Bottom Flasks.** 500 mL, T 24/40 joints, best source.

**7.3.2 Capacity Soxhlet Extractors.** 300 mL, with reflux condensers, best source.

**7.3.3 Kuderna-Danish Concentrator.** 500 mL, with Snyder columns, best source.

**7.3.4 Graduated Concentrator Tubes.** 10 mL, with 19/22 stoppers, best source.

**7.3.5 Graduated Concentrator Tubes.** 1 mL, with 14/20 stoppers, best source.

**7.3.6 TFE Fluorocarbon Tape.** 1/2 in., best source.

**7.3.7 Filter Tubes.** Size 40 mm (I.D.) x 80 mm.

**7.3.8 Serum Vials.** 1 mL and 5 mL, fitted with caps lined with TFE fluorocarbon.

**7.3.9 Pasteur Pipettes.** 9 in., best source.

**7.3.10 Glass Wool.** Fired at 500°C, best source.

**7.3.11 Boiling Chips.** Fired at 500°C, best source.

**7.3.12 Forceps.** Stainless steel, 12 in., best source.

**7.3.13 Gloves.** Latex or precleaned (5% ether/hexane Soxhlet extracted) cotton.

- 7.3.14 **Steam Bath.**
- 7.3.15 **Heating Mantles.** 500 mL.
- 7.3.16 **Analytical Evaporator.** Nitrogen blow-down.
- 7.3.17 **Acetone.** Pesticide quality.
- 7.3.18 **n-Hexane.** Pesticide quality.
- 7.3.19 **Diethyl Ether.** Preserved with 2% ethanol.
- 7.3.20 **Sodium Sulfate.** Anhydrous analytical grade.
- 7.3.21 **Alumina.** Activity Grade IV, 100/200 mesh.
- 7.3.22 **Glass Chromatographic Column.** 2-mm I.D. x 15-cm long.
- 7.3.23 **Soxhlet Extraction System.** Including Soxhlet extractors (500 and 300 mL), variable voltage transformers, and cooling water source.
- 7.3.24 **Vacuum Oven.** Connected to water aspirator.
- 7.3.25 **Die.**
- 7.3.26 **Ice Chest.**
- 7.3.27 **Silicic Acid.** Pesticide grade.
- 7.3.28 **Octachloronaphthalene (OCN).** Research grade.
- 7.3.29 **Florisil.** Pesticide grade.

## 8. Assembly and Calibration of Sampling System

### 8.1 Description of Sampling Apparatus

8.1.1 A typical sampling arrangement utilizing a personal air pump is shown in Figure 1. This method is designed to use air sampling pumps capable of pulling air through the sampling cartridge at flow rates of 1 to 5 L/min. The method writeup presents the use of this device.

8.1.2 The sampling cartridge (see Figure 2) consists of a glass sampling cartridge in which the PUF plug or PUF/Tenax® TA "sandwich" is retained.

### 8.2 Calibration of Sampling System

8.2.1 Air flow through the sampling system is calibrated by the assembly shown in Figure 4. All air sampler must be calibrated in the laboratory before and after each sample collection period, using the procedure described below.

8.2.2 For accurate calibration, attach the sampling cartridge in-line during calibration. Vinyl bubble tubing or other means (e.g., rubber stopper or glass joint) may be used to connect the large end of the cartridge to the calibration system. Refer to ASTM Practice D3686 or D4185, for procedures to calibrate small volume air pumps.

## 9. Preparation of PUF Sampling Cartridges

9.1 The PUF adsorbent is white and yellows upon exposure to light. The "yellowing" of PUF will not affect its ability to collect pesticides or PCBs.

9.2 For initial cleanup and quality assurance purposes, the PUF plug is placed in a Soxhlet extractor and extracted with acetone for 14 to 24 hours at 4 to 6 cycles per hour.

*[Note: If commercially pre-extracted PUF plugs are used, extraction with acetone is not required.]*

Follow with a 16-hour Soxhlet extraction with 5% diethyl ether in n-hexane. When cartridges are reused, 5% diethyl ether in n-hexane can be used as the cleanup solvent.

**9.3** Place the extracted PUF in a vacuum oven connected to a water aspirator and dry at room temperature for 2 to 4 hours (until no solvent odor is detected). Alternatively, they may be dried at room temperature in an air-tight container with circulating nitrogen (zero grade). Place the clean PUF plug into a labeled glass sampling cartridges using gloves and forceps. Wrap the cartridges with hexane-rinsed aluminum foil and placed in jars fitted with TFE fluorocarbon-lined caps. The foil wrapping may also be marked for identification using a blunt probe.

**9.4** Granular sorbents may be combined with PUF to extend the range of use to compounds with saturation vapor pressures greater than  $10^{-4}$  kPa (6). A useful combination trap can be assembled by "sandwiching" 0.6 g of Tenax-TA between two 22-mm I.D. x 3.8-cm pre-cleaned PUF plugs, as shown in Figure 2, Cartridge b. The Tenax-TA should be pre-extracted as described in Section 9.2. This trap may be extracted, vacuum dried, and removed without unloading it.

**9.5** Analyze at least one assembled cartridge from each batch as a laboratory blank before the batch is acceptable. A blank level of <10 ng/plug for single component compounds is considered to be acceptable. For multiple component mixtures (e.g., PCBs), the blank level should be <100 ng/plug.

**9.6** After cleaning, cartridges are considered clean up to 30 days when stored in sealed containers. Certified clean cartridges do not need to be chilled when shipping to the field.

## 10. Sampling

*[Note: After the sampling system has been assembled and calibrated as per Section 8, it can be used to collect air samples as described below. The prepared sample cartridges should be used within 30 days of certification and should be handled only with latex or precleaned cotton gloves.]*

**10.1** Carefully remove the clean sample cartridge from the aluminum foil wrapping (the foil is returned to jars for later use) and attached to the pump with flexible tubing. The sampling assembly is positioned with the intake downward or in horizontal position. Locate the sampler in an unobstructed area at least 30 meters from any obstacle to air flow. The PUF or PUF/XAD-2 cartridge intake is positioned 1 to 2 m above ground level. Cartridge height above ground is recorded on the Compendium Method TO-10A field test data sheet (FTDS), as illustrated in Figure 5.

**10.2** After the PUF cartridge is correctly inserted and positioned, the power switch is turned on and the sampling begins. The elapsed time meter is activated and the start time is recorded. The pumps are checked during the sampling process and any abnormal conditions discovered are recorded on the FTDS. Ambient temperatures and barometric pressures are measured and recorded periodically during the sampling procedure on the FTDS.

**10.3** At the end of the desired sampling period, the power is turned off, the PUF cartridge removed from the sampler and wrapped with the original aluminum foil and placed in a sealed, labeled container for transport, under blue ice (<4°C), back to the laboratory. At least one field blank is returned to the laboratory with each group of

samples. A field blank is treated exactly like a sample except that no air is drawn through the cartridge. Samples are stored at  $<4^{\circ}\text{C}$  or below until analyzed in the laboratory. Extraction must occur within 7 days of sampling and analysis within 40 days of extraction. Refer to ASTM D4861-94 (1), Appendix X3 for storage stability for various common pesticides and other compounds on PUF or PUF/Tenax TA sandwich.

## 11. Sample Extraction Procedure

*[Note: Sample extraction should be performed under a properly ventilated hood.]*

### 11.1 Sample Extraction

11.1.1 All samples should be extracted within 1 week after collection. All samples should be stored at  $<4^{\circ}\text{C}$  until extracted.

11.1.2 All glassware should be washed with a suitable detergent; rinsed with deionized water, acetone, and hexane; rinsed again with deionized water; and fired in an oven ( $500^{\circ}\text{C}$ ).

11.1.3 Prepare a spiking solution for determination of extraction efficiency. The spiking solution should contain one or more surrogate compounds that have chemical structures and properties similar to those of the analytes of interest. Octachloronaphthalene (OCN) and dibutylchlorodate have been used as surrogates for determination of organochlorine pesticides by GC with an ECD. Tetrachloro-m-xylene and decachlorobiphenyl can also be used together to insure recovery of early and late eluting compounds. For organophosphate pesticides, tributylphosphate or triphenylphosphate may be employed as surrogates. The surrogate solution should be prepared so that addition of 100  $\mu\text{L}$  into the PUF plug results in an extract containing the surrogate compound at the high end of the instrument's calibration range. As an example, the spiking solution for OCN is prepared by dissolving 10 mg of OCN in 10 mL of 10% acetone in n-hexane, followed by serial dilution n-hexane to achieve a final spiking solution of OCN of 1  $\mu\text{g/mL}$ .

*[Note: Use the recoveries of the surrogate compounds to monitor for unusual matrix effects and gross sample processing errors. Evaluate surrogate recovery for acceptance by determining whether the measured concentration falls within the acceptance limits of 60-120 percent.]*

11.1.4 The extracting solution (5% diethyl ether/hexane) is prepared by mixing 1900 mL of freshly opened hexane and 100 mL of freshly opened diethyl ether (preserved with ethanol) to a flask.

11.1.5 All clean glassware, forceps, and other equipment to be used should be rinsed with 5% diethyl ether/hexane and placed on rinsed (5% diethyl ether/hexane) aluminum foil until use. The condensing towers should also be rinsed with 5% diethyl ether/hexane. Then add 300 mL or 5% diethyl ether/hexane to the 500 mL round bottom boiling flask and add up to three boiling granules.

11.1.6 Using precleaned (i.e., 5% diethyl ether/hexane Soxhlet extracted) cotton gloves, the glass PUF cartridges are removed from the sealed container, the PUF removed from the glass container and is placed into the 300 mL Soxhlet extractor using prerinsed forceps.

*[Note: If "sandwich" trap is used, carefully clean outside walls of cartridge with hexane-soaked cotton swabs or laboratory tissues (discard) and place cartridge into extractor with intake (large end) downward.]*

11.1.7 Before extraction begins, add 100  $\mu\text{L}$  of the OCN solution directly to the top of the PUF plug.

*[Note: Incorporating a known concentration of the solution onto the sample provides a quality assurance check to determine recovery efficiency of the extraction and analytical processes.]*

**11.1.8** Connect the Soxhlet extractor to the 500 mL boiling flask and condenser. Wet the glass joints with 5% diethyl ether/hexane to ensure a tight seal between the fittings. If necessary, the PUF plug can be adjusted using forceps to wedge it midway along the length of the siphon. The above procedure should be followed for all samples, with the inclusion of a blank control sample.

**11.1.9** The water flow to the condenser towers of the Soxhlet extraction assembly should be checked and the heating unit turned on. As the samples boil, the Soxhlet extractors should be inspected to ensure that they are filling and siphoning properly (4 to 6 cycles/hour). Samples should cycle for a minimum of 16 hours.

**11.1.10** At the end of the extracting process (minimum of 16 hours), the heating unit is turned off and the sample cooled to room temperature.

**11.1.11** The extracts are then concentrated to 5 mL using a Kuderna-Danish (K-D) apparatus. The K-D is set up, assembled with concentrator tubes, and rinsed. The lower end of the filter tube is packed with glass wool and filled with sodium sulfate to a depth of 40 mm. The filter tube is then placed in the neck of the K-D. The Soxhlet extractors and boiling flasks are carefully removed from the condenser towers and the remaining solvent is drained into each boiling flask. Sample extract is carefully poured through the filter tube into the K-D. Each boiling flask is rinsed three times by swirling hexane along the sides. Once the sample has drained, the filter tube is rinsed down with hexane. Each Synder column is attached to the K-D and rinsed to wet the joint for a tight seal. The complete K-D apparatus is placed on a steam bath and the sample is evaporated to approximately 5 mL.

*[Note: Do not allow samples to evaporate to dryness.]*

Remove sample from the steam bath, rinse Synder column with minimum of hexane, and allow to cool. Adjust sample volume to 10 mL in a concentrator tube, close with glass stopper and seal with TFE fluorocarbon tape. Alternatively, the sample may be quantitatively transferred (with concentrator tube rinsing) to prescored vials and brought up to final volume. Concentrated extracts are stored at  $<4^{\circ}\text{C}$  until analyzed. Analysis should occur no later than 40 days after sample extraction.

## 11.2 Sample Cleanup

**11.2.1** If polar compounds (from example, organophosphorus and carbamate classes) that interfere with GC/ECD analysis are present, use column chromatographic cleanup or alumina. The sample cleanup will permit the analysis of most organochlorine pesticides or PCBs.

**11.2.2** Before cleanup, the sample extract is carefully reduced to 1 mL using a gentle stream of clean nitrogen.

**11.2.3** A glass chromatographic column (2-mm I.D. x 15-cm long) is packed with alumina, activity grade IV, and rinsed with approximately 20 mL of n-hexane. The concentrated sample extract is placed on the column and eluted with 10 mL of n-hexane at a rate of 0.5 mL/minute. The eluate volume is adjusted to exactly 10 mL and analyzed as per Section 12.

**11.2.4** If both PCBs and organochlorine pesticides are sought, alternate cleanup procedures (5,6) may be required (i.e., silicic acid).

**11.2.5** Finally, class separation and improved specificity can be achieved by column clean-up and separation on Florisil (6).

## 12. Analytical Procedure

### 12.1 Analysis of Organochlorine Pesticides by Capillary Gas Chromatography with Electron Capture Detector (GC/ECD)

*[Note: Organochlorine pesticides, PCBs and many nonchlorinated pesticides are responsive to electron capture detection (see Table 1). Most of these compounds can be analyzed at concentration of 1 to 50 ng/mL by GC/ECD. The following procedure is appropriate. Analytical methods that have been used to determine pesticides and PCBs collected from air by this procedure have been published (12).]*

**12.1.1** Select GC column (e.g., 0.3-mm by 30-m DB-5 column) and appropriate GC conditions to separate the target analytes. Typical operating parameters for this column with splitless injection are: Carrier gas-chromatography grade helium at a flow rate of 1 to 2 mL/min and a column head pressure of 7 to 9 psi (48 to 60 kPa); injector temperature of 250°C; detector temperature of 350°C; initial oven temperature of 50°C held for 2.0 min., ramped at 15°C/min to 150°C for 8 min, ramped at 10°C/min to 295°C then held for 5 min; purge time of 1.0 min. A typical injection volume is 2 to 3  $\mu$ L.

**12.1.2** Remove sample extract from the refrigerator and allow to warm to room temperature.

**12.1.3** Prepare standard solution from reference materials of known purity. Analytically pure standards of organochlorine pesticides and PCBs are available from several commercial sources.

**12.1.4** Use the standard solutions of the various compounds of interest to determine relative retention times (RRTs) to an internal standard such as p,p'-DDE, aldrin or octachloronaphthalene. Use 1 to 3- $\mu$ L injections or other appropriate volumes.

**12.1.5** Determine detector linearity by injecting standard solutions of three different concentrations (amounts) that bracket the range of analyses. The calibration is considered linear if the relative standard deviation (RSD) of the response factors for the three standards is 20 percent or less.

**12.1.6** Calibrate the system with a minimum of three levels of calibration standards in the linear range. The low standard should be near the analytical method detection limit. The calibration is considered linear if the relative standard deviation (RSD) of the response factors for the three standards is 20 percent or less. The initial calibration should be verified by the analysis of a standard from an independent source. Recovery of 85 to 115 percent is acceptable. The initial calibration curve should be verified at the beginning of each day and after every ten samples by the analysis of the mid point standard; an RPD of 15% or less is acceptable for continuing use of the initial calibration curve.

**12.1.7** Inject 1 to 3  $\mu$ L of the sample extract. Record volume injected to the nearest 0.05  $\mu$ L.

**12.1.8** A typical ECD response for a mixture of single component pesticides using a capillary column is illustrated in Figure 6. If the response (peak height or area) exceeds the calibration range, dilute the extract and reanalyze.

**12.1.9** Quantify PCB mixtures by comparison of the total heights or areas of GC peaks (minimum of 5) with the corresponding peaks in the best-matching standard. Use Aroclor 1242 for early-eluting PCBs and either Aroclor 1254 or Aroclor 1260 as appropriate for late-eluting PCBs.

**12.1.10** If both PCBs and organochlorine pesticides are present in the same sample, use column chromatographic separation on silicic acid (5,6) prior to GC analysis.

**12.1.11** If polar compounds are present that interfere with GC/ECD analysis, use column chromatographic cleanup or alumina, activity grade IV, in accordance with Section 11.2.

**12.1.12** For confirmation use a second GC column such as DB-608. All GC procedures except GC/MS require second column confirmation.

**12.1.13** For improved resolution use a capillary column such as an 0.25-mm I.D. x 30-m DB-5 with 0.25  $\mu$ m film thickness. The following conditions are appropriate.

- Helium carrier gas at 1 mL/min.
- Column temperature program, 90°C (4 min)/16°C/min to 154°C/4°C/min to 270°C.
- Detector,  $^{63}\text{Ni}$  ECD at 350°C.
- Make up gas, nitrogen, or 5% methane/95% argon at 60 mL/min.
- Splitless injection, 2  $\mu$ L maximum.
- Injector temperature, 220°C.

**12.1.14** Class separation and improved specificity can be achieved by column chromatographic separation on Florisil (6).

## **12.2 Analysis of Organophosphorus Pesticides by Capillary Gas Chromatography with Flame Photometric or Nitrogen-Phosphorus Detectors (GC/FPD/NPD)**

*[Note: Organophosphorus pesticides are responsive to flame photometric and nitrogen-phosphorus (alkali flame ionization) detection. Most of these compounds can be analyzed at concentrations of 50 to 500 ng/mL using either of these detectors.]*

**12.2.1** Procedures given in Section 12.1.1 through 12.1.9 and Section 12.1.13 through 12.1.14 apply, except for the selection of surrogates.

**12.2.2** Use tributylphosphate, triphenylphosphate, or other suitable compound(s) as surrogates to verify extraction efficiency and to determine RRTs.

## **12.3 Analysis of Carbamate and Urea Pesticides by Capillary Gas Chromatography with Nitrogen-Phosphorus Detector**

**12.3.1** Trazine, carbamate, and urea pesticides may be determined by capillary GC (DB-5, DB-17, or DB-1701 stationary phase) using nitrogen-phosphorus detection or MS-SIM with detection limits in the 0.05 to 0.2  $\mu$ L/mL range. Procedures given in Section 12.1.1 through 12.1.9 and Section 12.1.13 through 12.1.14 apply, except for the selection of surrogates, detector, and make up gas.

**12.3.2** Thermal degradation may be minimized by reducing the injector temperature to 200°C. HPLC may also be used, but detection limits will be higher (1 to 5  $\mu$ g/mL).

**12.3.3** N-methyl carbamates may be determined using reverse-phase high performance liquid chromatography (HPLC) (C-18) (Section 12.4) and post-column derivatization with o-phthaldehyde and fluorescence detection (EPA Method 531). Detection limits of 0.01 to 0.1  $\mu$ g/mL can be achieved.

## **12.4 Analysis of Carbamate, Urea, Pyrethroid, and Phenolic Pesticides by High Performance Liquid Chromatography (HPLC)**

*[Note: Many carbamate pesticides, urea pesticides, pyrethrins, phenols, and other polar pesticides may be analyzed by high HPLC with fixed or variable wavelength UV detection. Either reversed-phase or normal phase chromatography may be used. Detection limits are 0.2 to 10  $\mu$ g/mL of extract.]*

**12.4.1** Select HPLC column (i.e., Zorbax-SIL, 46-mm I.D. x 25-cm, or  $\mu$ -Bondapak C18, 3.9-mm x 30-cm, or equivalent).

**12.4.2** Select solvent system (i.e., mixtures of methanol or acetonitrile with water or mixtures of heptane or hexane with isopropanol).

**12.4.3** Follow analytical procedures given in Sections 12.1.2 through 12.1.9.

**12.4.4** If interferences are present, adjust the HPLC solvent system composition or use column chromatographic clean-up with silica gel, alumina, or Florisil (6).

**12.4.5** An electrochemical detector may be used to improve sensitivity for some ureas, carbamates, and phenolics. Much more care is required in using this detector, particularly in removing dissolved oxygen from the mobile phase and sample extracts.

**12.4.6** Chlorophenol (di- through penta-) may be analyzed by GC/ECD or GC/MS after derivatization with pentafluorobenzylbromide (EPA Method 604).

**12.4.7** Chlorinated phenoxyacetic acid herbicides and pentachlorophenol can be analyzed by GC/ECD or GC/MS after derivatization with diazomethane (EPA Method 515). DB-5 and DB-1701 columns (0.25-mm I.D. x 30-m) at 60 to 300°C/4°C per min have been found to perform well.

## **12.5 Analysis of Pesticides and PCBs by Gas Chromatography with Mass Spectrometry Detection (GC/MS)**

*[Note: A mass spectrometer operating in the selected ion monitoring mode is useful for confirmation and identification of pesticides.]*

**12.5.1** A mass spectrometer operating in the select ion monitoring (SIM) mode can be used as a sensitive detector for multi-residue determination of a wide variety of pesticides. Mass spectrometers are now available that provide detection limits comparable to nitrogen-phosphorus and electron capture detectors.

**12.5.2** Most of the pesticides shown in Table 1 have been successfully determined by GC/MS/SIM. Typical GC operating parameters are as described in Section 12.1.1.

**12.5.3** The mass spectrometer is typically operated using positive ion electron impact ionization (70 eV). Other instrumental parameters are instrument specific.

**12.5.4** p-Terphenyl-d<sub>14</sub> is commonly used as a surrogate for GC/MS analysis.

**12.5.5** Quantification is typically performed using an internal standard method. 1,4-Dichlorobenzene, naphthalene-d<sub>8</sub>, acenaphthene-d<sub>10</sub>, phenanthrene-d<sub>10</sub>, chrysene-d<sub>12</sub> and perylene-d<sub>12</sub> are commonly used as internal standards. Procedures given in Section 12.1.1 through 12.1.9 and Section 12.1.13 through 12.1.14 apply, except for the selection of surrogates, detector, and make up gas.

**12.5.6** See ASTM Practice D 3687 for injection technique, determination of relative retention times, and other procedures pertinent to GC and HPLC analyses.

## **12.6 Sample Concentration**

**12.6.1** If concentrations are too low to detect by the analytical procedure of choice, the extract may be concentrated to 1 mL or 0.5 mL by carefully controlled evaporation under an inert atmosphere. The following procedure is appropriate.

**12.6.2** Place K-D concentrator tube in a water bath and analytical evaporator (nitrogen blow-down) apparatus. The water bath temperature should be from 25°C to 50°C.

**12.6.3** Adjust nitrogen flow through hypodermic needle to provide a gentle stream.

**12.6.4** Carefully lower hypodermic needle into the concentrator tube to a distance of about 1 cm above the liquid level.

**12.6.5** Continue to adjust needle placement as liquid level decreases.

**12.6.6** Reduce volume to slightly below desired level.

12.6.7 Adjust to final volume by carefully rinsing needle tip and concentrator tube well with solvent (usually n-hexane).

### 13. Calculations

#### 13.1 Determination of Concentration

13.1.1 The concentration of the analyte in the extract solution can be taken from a standard curve where peak height or area is plotted linearly against concentration in nanograms per milliliter (ng/mL). If the detector response is known to be linear, a single point is used as a calculation constant.

13.1.2 From the standard curve, determine the nanograms of analyte standard equivalent to the peak height or area for a particular compound.

13.1.3 Ascertain whether the field blank is contaminated. Blank levels should not exceed 10 ng/sample for organochlorine pesticides or 100 ng/sample for PCBs and other pesticides. If the blank has been contaminated, the sampling series must be held suspect.

13.1.4 Quantity of the compound in the sample (A) is calculated using the following equation:

$$A = 1000 \left( \frac{A_s \times V_c}{V_i} \right)$$

where:

A = total amount of analyte in the sample, ng.

A<sub>s</sub> = calculated amount of material injected onto the chromatograph based on calibration curve for injected standards, ng.

V<sub>c</sub> = final volume of extract, mL.

V<sub>i</sub> = volume of extract injected, μL.

1000 = factor for converting microliters to milliliters.

13.1.5 The extraction efficiency (EE) is determined from the recovery of surrogate spike as follows:

$$EE(\%) = \left| \frac{S}{S_a} \right| [100]$$

where:

EE = extraction efficiency, %.

S = amount of spike recovered, ng.

S<sub>a</sub> = amount of spike added to plug, ng.

The extraction efficiency (surrogate recovery) must fall between 60-120% to be acceptable.

13.1.6 The total volume of air sampled under ambient conditions is determined using the following equation:

$$V_a = \frac{\sum_{i=1}^n (T_i \times F_i)}{1000 \text{ L/m}^3}$$

where:

$V_a$  = total volume of air sampled,  $\text{m}^3$ .

$T_i$  = length of sampling segment between flow checks, min.

$F_i$  = average flow during sampling segment, L/min.

**13.1.7** The air volume is corrected to EPA standard temperature ( $25^\circ\text{C}$ ) and standard pressure (760 mm Hg) as follows:

$$V_s = V_a \left( \frac{P_b - P_w}{760 \text{ mm Hg}} \right) \left( \frac{298\text{K}}{t_A} \right)$$

where:

$V_s$  = volume of air at standard conditions ( $25^\circ\text{C}$  and 760 mm Hg), std.  $\text{m}^3$ .

$V_a$  = total volume of air sampled,  $\text{m}^3$ .

$P_b$  = average ambient barometric pressure, mm Hg.

$P_w$  = vapor pressure of water at calibration temperature, mm Hg.

$t_A$  = average ambient temperature,  $^\circ\text{C} + 273$ .

**13.1.8** If the proper criteria for a sample have been met, concentration of the compound in a standard cubic meter of air sampled is calculated as follows:

$$C_a(\text{ng/std. m}^3) = \left[ \frac{(A)}{(V_s)} \right] \left[ \frac{(100)}{(SE(\%))} \right]$$

where:

SE = sampling efficiency as determined by the procedure outlined in Section 14.

If it is desired to convert the air concentration value to parts per trillion (ppt) in dry air at standard temperature and pressure (STP), the following conversion is used:

$$\text{ppt} = 0.844 (C_a)$$

The air concentration can be converted to parts per trillion (v/v) in air at STP as follows:

$$\text{pptv} = \left[ \frac{(24.45) (C_a)}{(MW)} \right]$$

where:

MW = molecular weight of the compound of interest, g/g-mole.

**13.1.9** If quantification is performed using an internal standard, a relative response factor (RRF) is calculated by the equation:

$$RRF = \frac{(I_s)(C_{is})}{(I_{is})(C_s)}$$

where:

$I_s$  = integrated area of the target analyte peak, counts.

$I_{is}$  = integrated area of the internal standard peak, counts.

$C_{is}$  = concentration of the internal standard, ng/ $\mu$ L.

$C_s$  = concentration of the analyte, ng/ $\mu$ L.

**13.1.10** The concentration of the analyte ( $C_a$ ) in the sample is then calculated as follows:

$$C_a = \frac{(I_s)(C_{is})}{(RRF)(I_{is})}$$

where:

$C_a$  = concentration of analyte, ng/ $m^3$

$I_s$  = integrated area of the target analyte peak, counts.

RRF = relative response factor (see Section 13.1.10).

## 14. Sampling and Retention Efficiencies

### 14.1 General

**14.1.1** Before using Compendium Method TO-10A, the user should determine the sampling efficiency for the compound of interest. The sampling efficiencies shown in Tables 2, 3, 4, and 5 were determined for approximately 1  $m^3$  of air at about 25°C, sampled at 3.8 L/min. The SE values in these tables may be used for similar sampling conditions; for other compounds or conditions, SE values must be determined.

**14.1.2** Sampling efficiencies for the pesticides shown in Table 6 are for a flowrate of 3.8 L/min and at 25°C. For compounds not listed, longer sampling times, different flow rates, or other air temperatures, the following procedure may be used to determine sampling efficiencies.

### 14.2 Determining SE

**14.2.1** SE is determined by a modified impinger assembly attached to the sampler pump, as illustrated in Figure 7. A clean PUF is placed in the pre-filter location and the inlet is attached to a nitrogen line.

*[Note: Nitrogen should be used instead of air to prevent oxidation of the compounds under test. The oxidation would not necessarily reflect what may be encountered during actual sampling and may give misleading sampling efficiencies.]*

Two PUF plugs (22-mm x 7.6-cm) are placed in the primary and secondary traps and are attached to the pump.

**14.2.2** A standard solution of the compound of interest is prepared in a volatile solvent (i.e., hexane, pentane, or benzene). A small, accurately measured volume (i.e., 1 mL) of the standard solution is placed into the modified midjet impinger. The sampler pump is set at the rate to be used in field application and then activated. Nitrogen is drawn through the assembly for a period of time equal to or exceeding that intended for field application. After the desired sampling test period, the PUF plugs are removed and analyzed separately as per Section 12.

**14.2.3** The impinger is rinsed with hexane or another suitable solvent and quantitatively transferred to a volumetric flask or concentrator tube for analysis.

**14.2.4** The sampling efficiency (SE) is determined using the following equation:

$$\% SE = \frac{W_1}{W_0 - W_r} \times 100$$

where:

$W_1$  = amount of compound extracted from the primary trap, ng.

$W_0$  = original amount of compound added to the impinger, ng.

$W_r$  = residue left in the impinger at the end of the test, ng.

**14.2.5** If material is found in the secondary trap, it is an indication that breakthrough has occurred. The addition of the amount found in the secondary trap,  $W_2$ , to  $W_1$ , will provide an indication for the overall sampling efficiency of a tandem-trap sampling system. The sum of  $W_1$ ,  $W_2$  (if any), and  $W_r$  must equal (approximately  $\pm 10\%$ )  $W_0$  or the test is invalid.

**14.2.6** If the compound of interest is not sufficiently volatile to vaporize at room temperature, the impinger may be heated in a water bath or other suitable heater to a maximum of  $50^\circ\text{C}$  to aid volatilization. If the compound of interest cannot be vaporized at  $50^\circ\text{C}$  without thermal degradation, dynamic retention efficiency ( $RE_d$ ) may be used to estimate sampling efficiency. Dynamic retention efficiency is determined in the manner described in Section 14.2.7. Table 7 lists those organochlorine pesticides which dynamic retention efficiencies have been determined.

**14.2.7** A pair of PUF plugs is spiked by slow, dropwise addition of the standard solution to one end of each plug. No more than 0.5 to 1 mL of solution should be used. Amounts added to each plug should be as nearly the same as possible. The plugs are allowed to dry for 2 hours in a clean, protected place (i.e., desiccator). One spiked plug is placed in the primary trap so that the spiked end is at the intake and one clean unspiked plug is placed in the secondary trap. The other spiked plug is wrapped in hexane-rinsed aluminum foil and stored in a clean place for the duration of the test (this is the static control plug, Section 14.2.8). Prefiltered nitrogen or ambient air is drawn through the assembly as per Section 14.2.2.

[*Note: Impinger may be discarded.*]

Each PUF plug (spiked and static control) is analyzed separately as per Section 12.

**14.2.8** This dynamic retention efficiency ( $\% RE_d$ ) is calculated as follows:

$$\% RE_d = \frac{W_1}{W_0} \times 100$$

where:

$W_1$  = amount of compound recovered from primary plug, ng.

$W_o$  = amount of compound added to primary plug, ng.

If a residue,  $W_2$ , is found on the secondary plug, breakthrough has occurred. The sum of  $W_1 + W_2$  must equal  $W_o$ , within 25% or the test is invalid. For most compounds tested by this procedure, %  $RE_d$  values are generally less than % SE values determined per Section 14.2. The purpose of the static  $RE_d$  determination is to establish any loss or gain of analyte unrelated to the flow of nitrogen or air through the PUF plug.

## 15. Performance Criteria and Quality Assurance

*[Note: This section summarizes required quality assurance (QA) measures and provides guidance concerning performance criteria that should be achieved within each laboratory.]*

### 15.1 Standard Operating Procedures (SOPs)

**15.1.1** Users should generate SOPs describing the following activities accomplished in their laboratory: (1) assembly, calibration, and operation of the sampling system, with make and model of equipment used; (2) preparation, purification, storage, and handling of sampling cartridges; (3) assembly, calibration, and operation of the analytical system, with make and model of equipment used; and (4) all aspects of data recording and processing, including lists of computer hardware and software used.

**15.1.2** SOPs should provide specific stepwise instructions and should be readily available to, and understood by, the laboratory personnel conducting the work.

### 15.2 Process, Field, and Solvent Blanks

**15.2.1** One PUF cartridge from each batch of approximately twenty should be analyzed, without shipment to the field, for the compounds of interest to serve as a process blank.

**15.2.2** During each sampling episode, at least one PUF cartridge should be shipped to the field and returned, without drawing air through the sampler, to serve as a field blank.

**15.2.3** Before each sampling episode, one PUF plug from each batch of approximately twenty should be spiked with a known amount of the standard solution. The spiked plug will remain in a sealed container and will not be used during the sampling period. The spiked plug is extracted and analyzed with the other samples. This field spike acts as a quality assurance check to determine matrix spike recoveries and to indicate sample degradation.

**15.2.4** During the analysis of each batch of samples, at least one solvent process blank (all steps conducted but no PUF cartridge included) should be carried through the procedure and analyzed.

**15.2.5** All blank levels should not exceed 10 ng/sample for single components or 100 ng/sample for multiple component mixtures (i.e., for organochlorine pesticides and PCBs).

### 15.3 Sampling Efficiency and Spike Recovery

**15.3.1** Before using the method for sample analysis, each laboratory must determine its sampling efficiency for the component of interest as per Section 14.

**15.3.2** The PUF in the sampler is replaced with a hexane-extracted PUF. The PUF is spiked with a microgram level of compounds of interest by dropwise addition of hexane solutions of the compounds. The solvent is allowed to evaporate.

**15.3.3** The sampling system is activated and set at the desired sampling flow rate. The sample flow is monitored for 24 hours.

**15.3.4** The PUF cartridge is then removed and analyzed as per Section 12.

**15.3.5** A second sampler, unspiked, is collected over the same time period to account for any background levels of components in the ambient air matrix.

**15.3.6** In general, analytical recoveries and collection efficiencies of 75% are considered to be acceptable method performance.

**15.3.7** Replicate (at least triplicate) determinations of collection efficiency should be made. Relative standard deviations for these replicate determinations of  $\pm 15\%$  or less are considered acceptable performance.

**15.3.8** Blind spiked samples should be included with sample sets periodically as a check on analytical performance.

#### 15.4 Method Precision and Bias

**15.4.1** Precision and bias in this type of analytical procedure are dependent upon the precision and bias of the analytical procedure for each compound of concern, and the precision and bias of the sampling process.

**15.4.2** Several different parameters involved in both the sampling and analysis steps of this method collectively determine the precision and bias with which each compound is detected. As the volume of air sampled is increased, the sensitivity of detection increases proportionately within limits set by: (a) the retention efficiency for each specific component trapped on the polyurethane foam plug, and (b) the background interference associated with the analysis of each specific component at a given site sampled. The sensitivity of detection of samples recovered by extraction depends on: (a) the inherent response of the particular GC detector used in the determinative step, and (b) the extent to which the sample is concentrated for analysis. It is the responsibility of the analyst(s) performing the sampling and analysis steps to adjust parameters so that the required detection limits can be obtained.

**15.4.3** The reproducibility of this method for most compounds for which it has been evaluated has been determined to range from  $\pm 5$  to  $\pm 30\%$  (measured as the relative standard deviation) when replicate sampling cartridges are used ( $N > 5$ ). Sample recoveries for individual compounds generally fall within the range of 90 to 110%, but recoveries ranging from 65 to 125% are considered acceptable. PUF alone may give lower recoveries for more volatile compounds (i.e., those with saturation vapor pressures  $> 10^{-3}$  mm Hg). In those cases, another sorbent or a combination of PUF and Tenax TA (see Figure 2) should be employed.

#### 15.5 Method Safety

**15.5.1** This procedure may involve hazardous materials, operations, and equipment. This method does not purport to address all of the safety problems associated with its use.

**15.5.2** It is the user's responsibility to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to the implementation of this procedure. This should be part of the user's SOP manual.

#### 16. References

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TABLE 1. COMPOUNDS FOR WHICH PROCEDURE HAS BEEN TESTED<sup>1</sup>

Compound	Recommended Analysis <sup>2</sup>	Compound	Recommended Analyses
Alachlor	GC/ECD	Heptachlor	GC/ECD
Aldrin	GC/ECD	Heptachlor epoxide	GC/ECD
Allethrin	HPLC/UV	Hexachlorobenzene	GC/ECD
Aroclor 1242	GC/ECD	Hexachlorocyclopentadiene <sup>3,4</sup>	GC/ECD
Aroclor 1254	GC/ECD	Lindane ( $\gamma$ -BHC)	GC/ECD
Aroclor 1260	GC/ECD	Linuron	HPLC/UV
Atrazine	GC/NPD	Malathion	GC/NPD or FPD
Bendiocarb	HPLC/UV	Methyl parathion	GC/NPD or FPD
BHC ( $\alpha$ - and $\beta$ -Hexachlorocyclohexanes)	GC/ECD	Methoxychlor	GC/FCD
Captan	GC/ECD	Metolachlor	GC/ECD
Carbaryl	HPLC/UV	Mexacarbate	GC/FCD
Carbofuran	HPLC/UV	Mirex	GC/ECD
Chlordane, technical	GC/ECD	Monuron	HPLC/UV
Chlorothalonil	GC/ECD	Trans-nonachlor	GC/ECD
Chlorotoluron	HPLC/UV	Oxychlordane	GC/ECD
Chlorpyrifos	GC/ECD	Pentachlorobenzene	GC/ECD
2,4-D esters and salts	GC/ECD	Pentachlorophenol	GC/ECD
Dacthal	GC/ECD	Permethrin (cis and trans)	HPLC/UV
p,p'-DDT	GC/ECD	o-Phenylphenol	HPLC/UV
p,p'-DDE	GC/ECD	Phorate	GC/NPD or FPD
Diazinon	GC/NPD or FPD	Propazine	GC/NPD
Dicloran	GC/ECD	Propoxur (Baygon)	HPLC/UV
Dieldrin	GC/ECD	Pyrethrin	HPLC/UV
Dichlorovos (DDVP)	GC/ECD	Resmethrin	HPLC/UV
Dicofol	GC/ECD	Ronnel	GC/ECD
Dicrotophos	HPLC/UV	Simazine	HPLC/UV
Diuron	HPLC/UV	Terbuthiuron	HPLC/UV
Ethyl parathion	GC/NPD or FPD	1,2,3,4-tetrachlorobenzene <sup>3</sup>	GC/ECD
Fenvalerate	HPLC/UV	1,2,3-trichlorobenzene <sup>3</sup>	GC/ECD
Fluometuron	HPLC/UV	2,3,5-trichlorophenol	GC/ECD
Folpet	GC/ECD	Trifluralin	GC/ECD

<sup>1</sup>The following recommendations are specific for that analyte for maximum sensitivity.

<sup>2</sup>GC = gas chromatography; ECD = electron capture detector, FPD = flame photometric detector; HPLC = high performance liquid chromatography; NPD = nitrogen-phosphorus detector; UV = ultraviolet absorption detector, (GC/MS (gas chromatography/mass spectrometry) may also be used).

<sup>3</sup>Using PUF/Tenax-TA "sandwich" trap.

<sup>4</sup>Compound is very unstable in solution.

TABLE 2. SAMPLING EFFICIENCIES FOR SOME ORGANOCHLORINE PESTICIDES

Compound	Quantity Introduced, $\mu\text{g}^2$	Air Volume, $\text{m}^3$	Sampling efficiency, %		
			mean	RSD	n
$\alpha$ -Hexachlorocyclohexane ( $\alpha$ -BHC)	0.005	0.9	115	8	6
$\gamma$ -Hexachlorocyclohexane (Lindane)	0.05-1.0	0.9	91.5	8	5
Chlordane, technical	0.2	0.9	84.0	11	8
p,p'-DDT	0.6, 1.2	0.9	97.5	21	12
p,p'-DDE	0.2, 0.4	0.9	102	11	12
Mirex	0.6, 1.2	0.9	85.9	22	7
2,4-D Esters:					
Isopropyl	0.5	3.6	92.0	5	12
Butyl	0.5	3.6	82.0	10	11
Isobutyl	0.5	3.6	79.0	20	12
Isoctyl	0.5	3.6	>80 <sup>2</sup>	--	--

<sup>1</sup>Air volume = 0.9  $\text{m}^3$ .<sup>2</sup>Not vaporized. Value base on %RE = 81.0 (RSD = 10%, n = 6).

TABLE 3. SAMPLING EFFICIENCIES FOR ORGANOPHOSPHORUS PESTICIDES

Compound	Quantity Introduced, $\mu\text{g}^2$	Sampling efficiency, %		
		mean	RSD	n
Dichlorvos (DDVP)	0.2	72.0	13	2
Ronnel	0.2	106	8	12
Chlorpyrifos	0.2	108	9	12
Diazinon <sup>1</sup>	1.0	84.0	18	18
Methyl parathion <sup>1</sup>	0.6	80.0	19	18
Ethyl parathion <sup>1</sup>	0.3	75.9	15	18
Malathion <sup>1</sup>	0.3	100 <sup>3</sup>	--	--

<sup>1</sup>Analyzed by gas chromatography with nitrogen phosphorus detector or flame photometric detector.<sup>2</sup>Air volume = 0.9  $\text{m}^3$ .<sup>3</sup>Decomposed in generator; value based on %RE = 101 (RDS = 7, n = 4).

TABLE 4. SAMPLING EFFICIENCIES FOR SOME SEMI-VOLATILE  
ORGANOCHLORINE COMPOUNDS AND PCBs

Compound	Quantity Introduced, $\mu\text{g}$ <sup>1</sup>	Sampling efficiency, %		
		mean	RSD	n
1,2,3-Trichlorobenzene	1.0	6.6 <sup>2</sup>	22	8
1,2,3,4-Tetrachlorobenzene	1.0	62.3 <sup>2</sup>	33	5
Pentachlorobenzene	1.0	94.0	12	5
Hexachlorobenzene	0.5, 1.0	94.5	8	5
Hexachlorocyclopentadiene	1.0	8.3 <sup>2</sup>	12	5
2,4,5-Trichlorophenol	1.0	108	3	5
Pentachlorophenol	1.0	107	16	5
Aroclor 1242	0.1	96.0	15	6
Aroclor 1254	0.1	95.0	7	6
Aroclor 1260	0.1	109	5	11

<sup>1</sup> Air volume = 0.9 m<sup>3</sup>.<sup>2</sup> SEs were 98, and 97% (n = 2), respectively, for these three compounds by the PUF/Tenax® TA "sandwich" trap.

TABLE 5. SAMPLING EFFICIENCIES FOR CARBAMATES, UREAS, TRIAZINES, AND PYRETHRINS

Compound	Spike Level, µg/plug	Static Recovery, %		n	Retention Efficiency, %		n	Sampling Efficiency, %		n
		mean	RSDP		mean	RSD		mean	RSD	
Carbamates:										
Propoxur	5	61.4	10	6	77.6	37	6	96.7	11	6
Carbofuran	15	55.3	12	6	64.2	46	6	87.2	14	6
Bendicarb	50	57.3	11	6	69.8	43	6	62.1	14	6
Mexacarbate	10	62.8	19	6	62.7	41	6	89.8	14	6
Carbaryl	100	56.6	14	6	63.6	53	6	0	13	6
Ureas:										
Monuron	19	87.0	6	6	91.2	6	5	0		
Diuron	20	84.1	8	6	90.0	2	5	0		
Linuron	20	86.7	8	6	92.5	4	5	0		
Terbuthiuron	18	85.0	8	6	88.8	8	5	0		
Fluometuron	20	91.4	10	6	101	3	5	0		
Chlortoluron	20	86.2	11	6	92.0	7	5	0		
Triazines:										
Simazine	10	103	6	5	101	9	6	0		
Atrazine	10	104	7	5	98.9	7	6	0		
Propazine	10	105	11	5	99.9	14	6	0		
Pyrethrins:										
Pyrethrin I	(9.7)	90.5	10	6	95.6	22	5	0		
Pyrethrin II	(6.1)	88.6	11	6	69.9	29	5	0		
Allethrin	25	69.2	9	5	58.3	12	6	0		
d-trans-Allethrin	25	76.8	9	6	74.4	9	5	0		
Dicrotophos	25	72.0	22	6	71.7	8	5	0		
Resmethrin	25	76.5	14	6	66.7	14	6	0		
Fenvalerate	25	87.9	3	6	57.2	20	3	0		

TABLE 6. EXTRACTION AND 24-H SAMPLING EFFICIENCIES FOR VARIOUS PESTICIDES AND RELATED COMPOUNDS

Compound	Extraction Efficiency <sup>1</sup> , %		Sampling Efficiency <sup>2</sup> , %, at					
			10 ng/m <sup>3</sup>		100 ng/m <sup>3</sup>		1,000 ng/m <sup>3</sup>	
	mean	RSD	mean	RSD	mean	RSD	mean	RSD
Chlpropyrifos	83.3	11.5	83.7	18.0	92.7	15.1	83.7	18.0
Pentachlorophenol	84.0	22.6	66.7	42.2	52.3	36.2	66.7	42.2
Chlordane	95.0	7.1	96.0	1.4	74.0	8.5	96.0	1.4
o-Phenylphenol	47.0	46.7	46.0	19.1	45.3	29.9	46.0	19.1
Lindane	96.0	6.9	91.7	11.6	93.0	2.6	91.7	11.6
DDVP	88.3	20.2	51.0	53.7	106.0	1.4	51.0	53.7
2,4-D Methyl Ester	--	--	75.3	6.8	58.0	23.6	75.3	6.8
Heptachlor	99.0	1.7	97.3	13.6	103.0	17.3	97.3	13.6
Aldrin	97.7	4.0	90.7	5.5	94.0	2.6	90.7	5.5
Dieldrin	95.0	7.0	82.7	7.6	85.0	11.5	82.7	7.6
Ronnel	80.3	19.5	74.7	12.1	60.7	15.5	74.7	12.2
Diazinon	72.0	21.8	63.7	18.9	41.3	26.6	63.7	19.9
trans-Nonachlor	97.7	4.0	96.7	4.2	101.7	15.3	96.7	4.2
Oxychlorodane	100.0	0.0	95.3	9.5	94.3	1.2	95.3	9.5
$\alpha$ -BHC	98.0	3.5	86.7	13.7	97.0	18.2	86.7	13.7
Bendiocarb	81.3	8.4	59.7	16.9	30.7	23.5	59.7	16.9
Chlorothalonil	90.3	8.4	76.7	6.1	70.3	6.5	76.7	6.1
Heptachlor Epoxide	100.0	0.0	95.3	5.5	97.7	14.2	95.3	5.5
Dacthal	--	--	87.0	9.5	95.3	22.2	87.0	9.5
Aroclor 1242	91.7	14.4	95.0	15.5	94.7	17.5	95.0	15.5

<sup>1</sup>Mean values for one spike at 550 ng/plug and two spikes at 5,500 ng/plug.<sup>2</sup>Mean values for three determinations.

TABLE 7. EXTRACTION AND 24-H DYNAMIC RETENTION EFFICIENCIES FOR VARIOUS PESTICIDES AND RELATED COMPOUNDS

Compound	Extraction Efficiency, %		Sampling Efficiency <sup>2</sup> , %, at					
			10 ng/m <sup>3</sup>		100 ng/m <sup>3</sup>		1,000 ng/m <sup>3</sup>	
	mean	RSD	mean	RSD	mean	RSD	mean	RSD
Propoxur	77.5	71.4	92.0	--	91.7	22.8	101.0	18.4
Resmethrin	95.5	71.4	79.0	--	100.7	13.1	107.0	4.4
Dicofol	57.0	8.5	38.0	25.9	65.0	8.7	69.0	--
Captan	73.0	12.7	56.0	--	45.5	64.3	84.3	16.3
Carbaryl	74.0	82.0	102.0	--	61.0	--	113.0	6.1
Malathion	76.5	44.5	108.0	--	54.0	16.0	77.3	7.6
cis-Permethrin	88.7	10.3	101.0	28.5	85.0	26.9	89.0	11.3
trans-Permethrin	88.7	11.0	67.3	34.8	80.7	56.4	108.3	9.5
Methoxychlor	65.5	4.9	--	--	--	--	78.5	2.1
Atrazine	75.0	50.5	--	--	73.0	30.1	83.0	9.5
Folpet	86.7	11.7	--	--	78.0	--	93.0	--
Aroclor 1260	92.0	14.5	88.0	9.6	85.3	9.9	107.1	13.6

<sup>1</sup>Mean values for one spike at 550 ng/plug and two spikes at 5,500 ng/plug.<sup>2</sup>Mean values for three determinations.

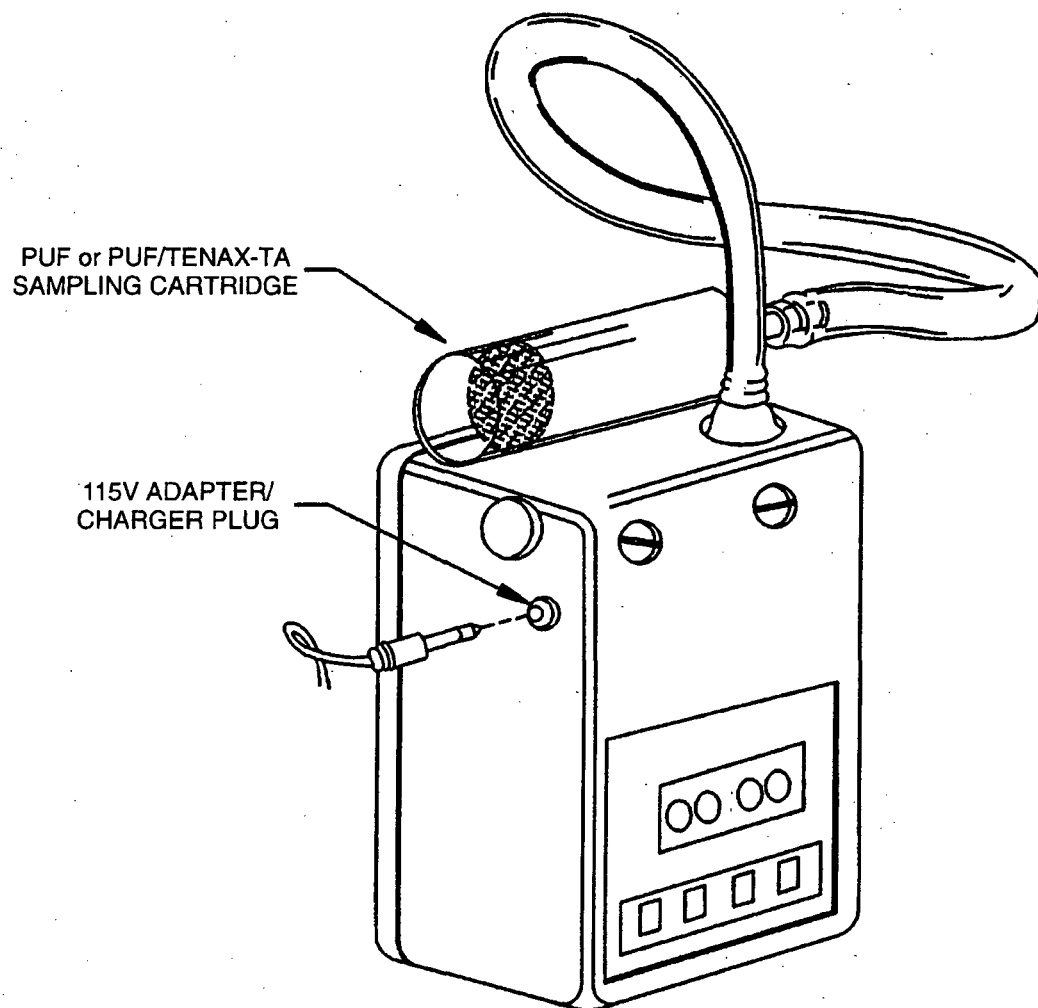


Figure 1. Low volume air sampler.

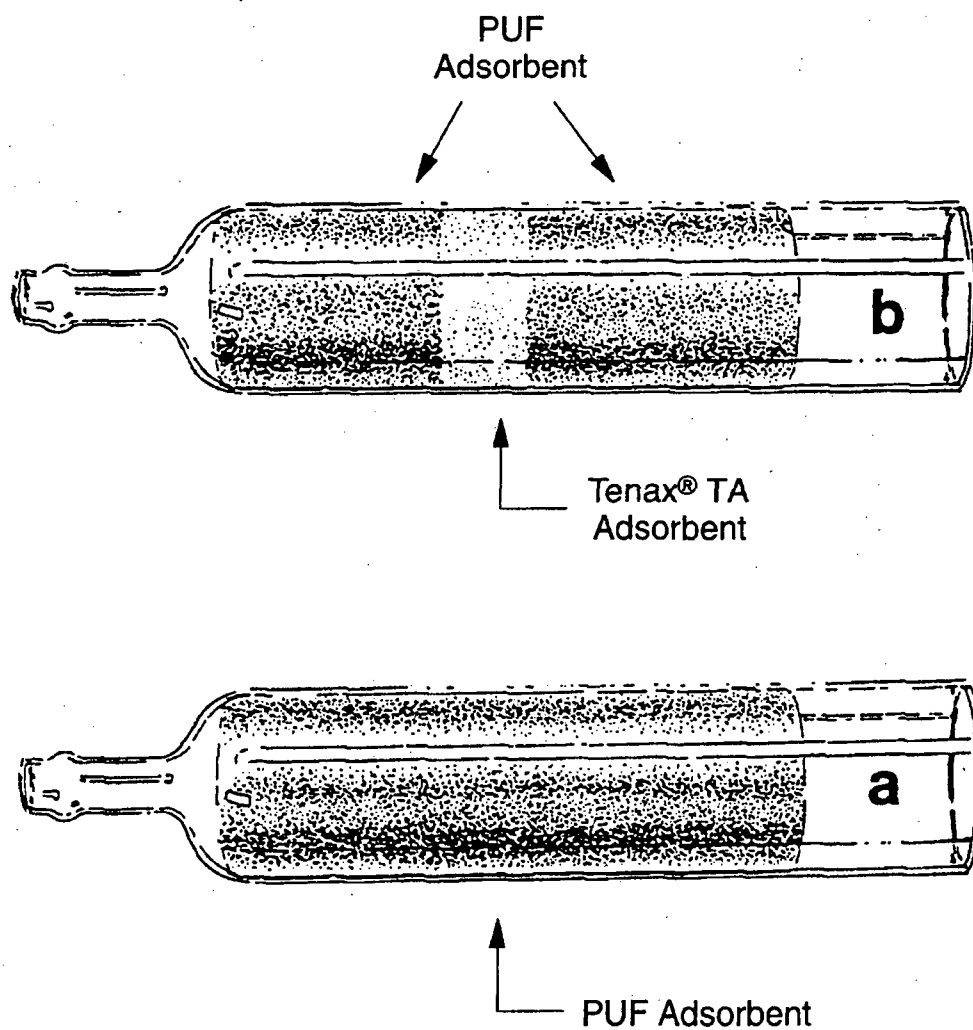


Figure 2. Polyurethane foam (PUF) sampling cartridge (a) and PUF-Tenax® TA "sandwich" sampling cartridge (b).

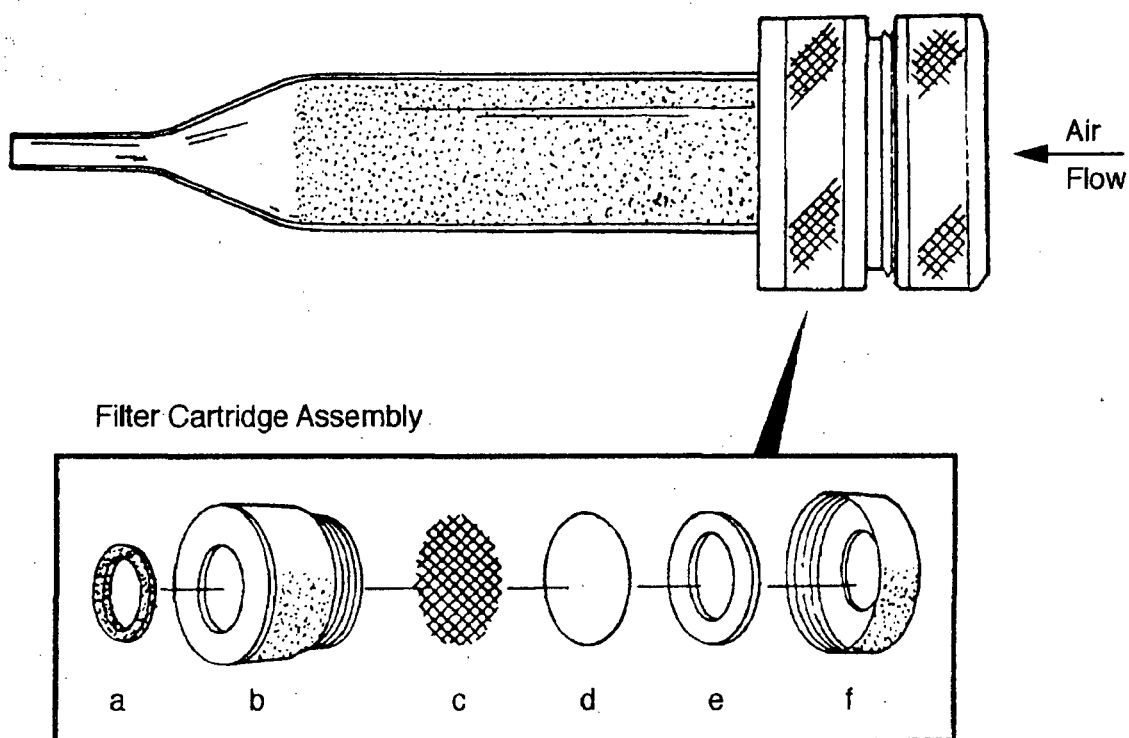


Figure 3. Open-face filter assembly attached to a PUF cartridge:  
(a) Inner Viton® o-ring, (b) filter cartridge, (c) stainless steel screen, (d) quartz filter,  
(e) filter ring, and (f) cartridge screw cap.

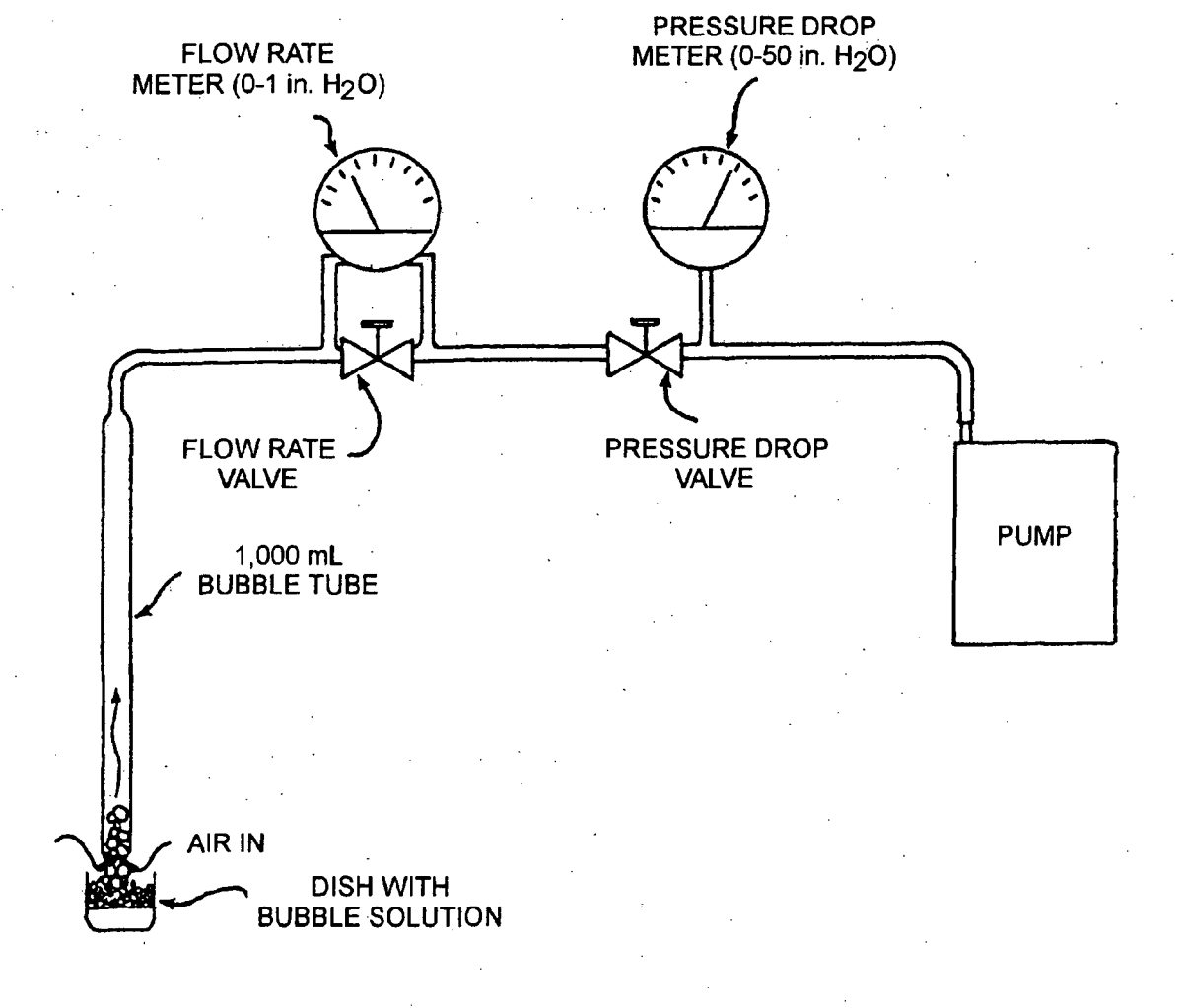


Figure 4. Calibration assembly for air sampler pump.

### COMPENDIUM METHOD TO-10A FIELD TEST DATA SHEET (FTDS)

#### I. GENERAL INFORMATION

PROJECT: \_\_\_\_\_ DATE(S) SAMPLED: \_\_\_\_\_  
 SITE: \_\_\_\_\_ TIME PERIOD SAMPLED: \_\_\_\_\_  
 LOCATION: \_\_\_\_\_ OPERATOR: \_\_\_\_\_  
 INSTRUMENT MODEL NO.: \_\_\_\_\_ CALIBRATED BY: \_\_\_\_\_  
 PUMP SERIAL NO.: \_\_\_\_\_ RAIN: \_\_\_\_ YES \_\_\_\_ NO

#### ADSORBENT CARTRIDGE INFORMATION:

	Cartridge 1	Cartridge 2	Cartridge 3	Cartridge 4
Type:	_____	_____	_____	_____
Adsorbent:	_____	_____	_____	_____
Serial No.:	_____	_____	_____	_____
Sample No.:	_____	_____	_____	_____

#### II. SAMPLING DATA

Cartridge Identifi- cation	Sampling Location	Ambient Temp., °F	Ambient Pressure, in Hg	Flow Rate (Q), mL/min		Sampling Period		Total Sampling Time, min.	Total Sample Volume, L
				Cartridge 1	Cartridge 2	Start	Stop		

#### III. FIELD AUDIT

	<u>Cartridge 1</u>	<u>Cartridge 2</u>	<u>Cartridge 3</u>	<u>Cartridge 4</u>
Audit Flow Check Within	_____	_____	_____	_____
10% of Set Point (Y/N)?	pre- _____	pre- _____	pre- _____	pre- _____
	post- _____	post- _____	post- _____	post- _____

CHECKED BY: \_\_\_\_\_

DATE: \_\_\_\_\_

Figure 5. Compendium Method TO-10A field test data sheet.

**OPERATING CONDITIONS**

Column Type: DB-5 0.32 capillary,  
0.25  $\mu$ m film thickness

Column Temperature Program: 90°C(4min)/16°C per min to  
154°C/4°C per min to 270°C.

Detector: Electron Capture

Carrier Gas: Helium at 1 mL/min.

Make Up Gas: 5% Methane/95% Argon at 60 mL/min.

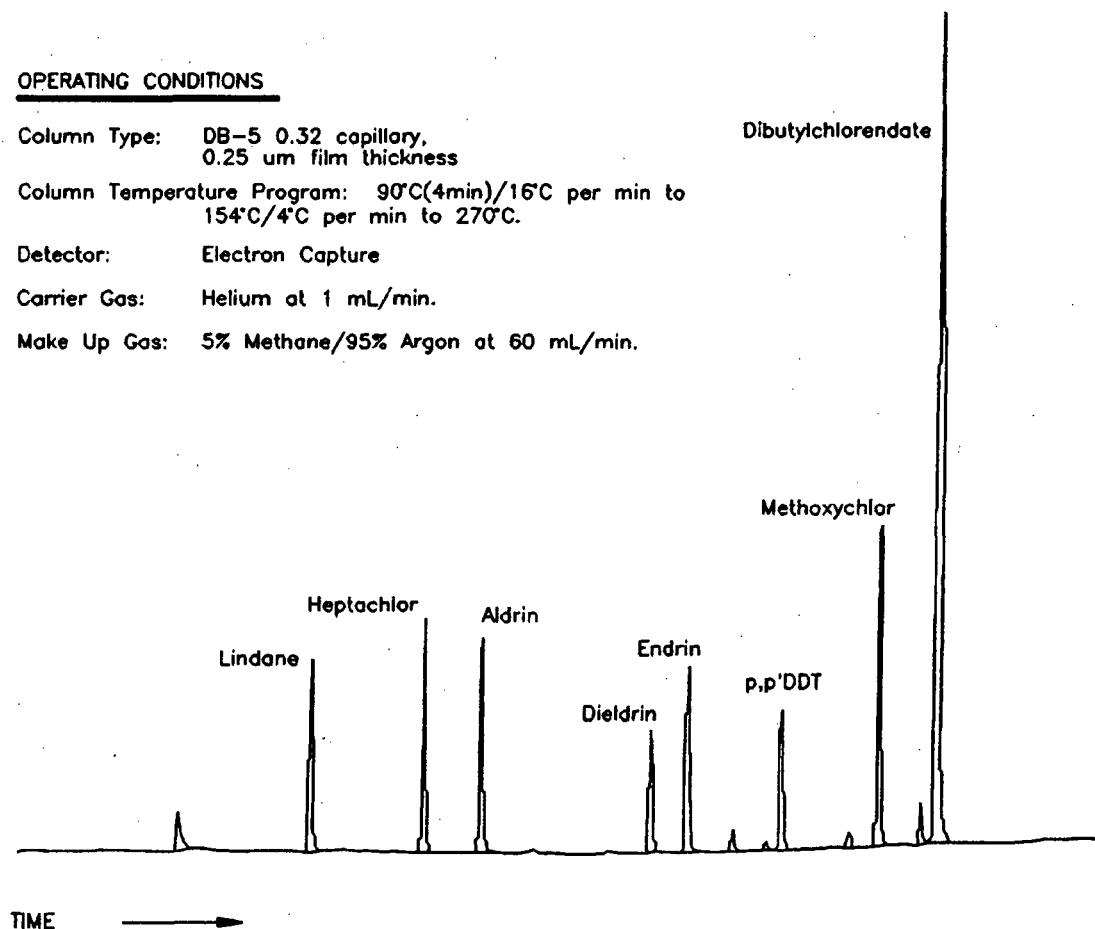


Figure 6. Chromatogram showing a mixture of single component pesticides determined by GC/ECD using a capillary column.

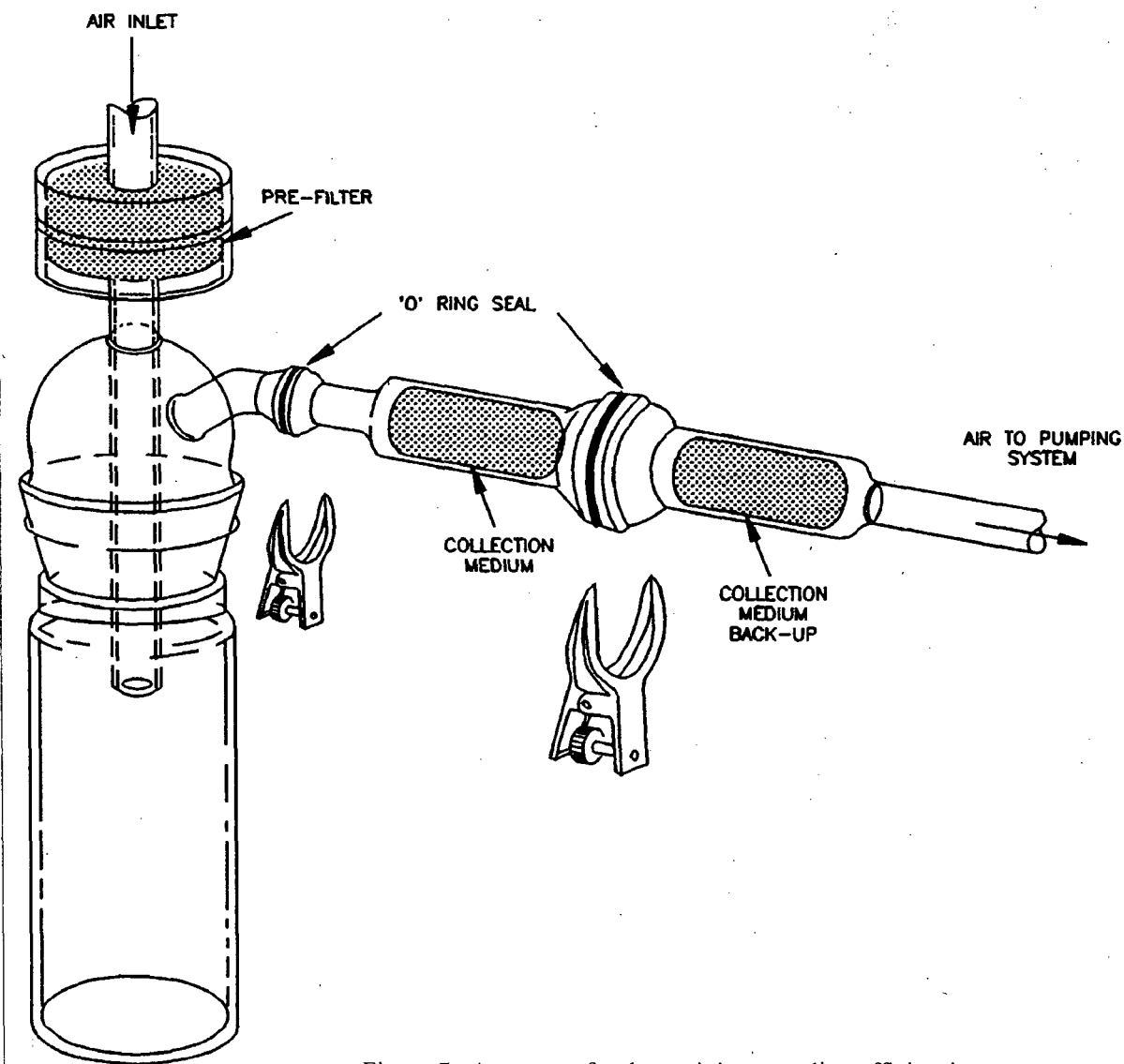


Figure 7. Apparatus for determining sampling efficiencies.



1

## PRE-CONSTRUCTION PHASE

0100	Notice To Proceed	1	0	07JUL05*	07JUL05	0.00
0110	Client Kickoff Meeting	1	0	08JUL05	08JUL05	0.00
0120	Site Reconnaissance	1	0	12JUL05*	12JUL05	0.00
0130	Develop DQO Package	1	0	13JUL05	13JUL05	0.00
0140	DQO Discussion Meeting	1	0	14JUL05	14JUL05	0.00
0150	Prepare Draft RA Plans	13	0	15JUL05	02AUG05	0.00
0160	Draft RA Plans to CDE Team	2	0	03AUG05	04AUG05	0.00
0170	CDE Team Review of Draft RA Plans	28	0	05AUG05	13SEP05	0.00
0180	CAPE RTCs to CDE Team Comments of Draft RA Plans	14	0	06SEP05	23SEP05	0.00
0770	RTCs to CDE Team for Review	8	0	14SEP05	23SEP05	0.00
0190	RTC Concurrence Meeting	1	0	27SEP05	27SEP05	0.00
0200	CAPE Finalize 95% Design Project Plans	1	0	28SEP05	28SEP05	0.00
0210	CAPE Submit 95% Design Project Plans	1	0	29SEP05	29SEP05	0.00
0220	Prepare for Pre-Excavation Sampling	14	0	30SEP05	19OCT05	0.00
0240	Prepare for RA Activities	19	0	30SEP05	26OCT05	0.00
0820	Finalize 100% Design Project Plans	18	0	30SEP05	25OCT05	0.00
0830	Submit 100% Design Project Plans	1	0	26OCT05	26OCT05	0.00
0230	Pre-Excavation Sampling (4 Properties)	4	0	01NOV05	04NOV05	0.00
0250	Conduct Pre-Construction Meetings	1	0	07NOV05	07NOV05	0.00

## CONSTRUCTION PHASE

0260	Mobilization	4	0	01NOV05	04NOV05	0.00
0270	Excavation	3	0	07NOV05	09NOV05	0.00
0280	Confirmation Sampling	3	0	07NOV05	09NOV05	0.00
0290	Site Restoration	4	0	07NOV05	10NOV05	0.00
0300	Excavation	3	0	11NOV05	15NOV05	0.00
0310	Confirmation Sampling	3	0	11NOV05	15NOV05	0.00
0320	Site Restoration	4	0	11NOV05	16NOV05	0.00
0330	Excavation	2	0	17NOV05	18NOV05	0.00
0340	Confirmation Sampling	2	0	17NOV05	18NOV05	0.00
0350	Site Restoration	3	0	17NOV05	21NOV05	0.00
0360	Excavation	6	0	03APR06	10APR06	0.00
0370	Confirmation Sampling	6	0	03APR06	10APR06	0.00
0380	Site Restoration	7	0	03APR06	11APR06	0.00
0390	Pre-Final Inspection	1	0	12APR06	12APR06	0.00
0400	Completion of Punchlist Items	5	0	13APR06	19APR06	0.00
0410	Demobilization of Site Facilities	3	0	20APR06	24APR06	0.00
0420	Final Inspection	1	0	25APR06	25APR06	0.00
0430	Removal Action Complete	0	0		25APR06	0.00

## POST CONSTRUCTION PHASE

0780	USEPA Mtg - Determine 45 Dust Sampling Locations	1	0	06DEC05	06DEC05	0.00
0790	Dust Sampling OU1 Phase A&B Properties	25	0	07DEC05	10JAN06	0.00
0800	Sample Data Consolidation	30	0	11JAN06	21FEB06	0.00
0810	Sample Data Validation	30	0	22FEB06	04APR06	0.00
0440	Prepare Draft Construction Completion Report	20	0	26APR06	23MAY06	0.00
0450	USACE Review of Internal Draft CCR (Electronic)	15	0	24MAY06	13JUN06	0.00
0460	CAPE Finalizes Draft CCR for Submittal	5	0	14JUN06	20JUN06	0.00
0470	Submittal of Draft CCR to USEPA	1	0	21JUN06	21JUN06	0.00
0480	USEPA Review of Draft CCR	23	0	22JUN06	24JUL06	0.00
0490	USEPA Comments to USACE/CAPE	1	0	25JUL06	25JUL06	0.00

Start Date 20JUN05  
 Finish Date 17AUG06  
 Date 20JUN05  
 Date 25OCT05 16:41

Notice To Proceed  
 Client Kickoff Meeting  
 Site Reconnaissance  
 Develop DQO Package  
 DQO Discussion Meeting  
 Prepare Draft RA Plans  
 Draft RA Plans to CDE Team  
 CDE Team Review of Draft RA Plans  
 CAPE RTCs to CDE Team Comments of Draft RA Plans  
 RTCs to CDE Team for Review  
 RTC Concurrence Meeting  
 CAPE Finalize 95% Design Project Plans  
 CAPE Submit 95% Design Project Plans  
 Prepare for Pre-Excavation Sampling  
 Prepare for RA Activities  
 Finalize 100% Design Project Plans  
 Submit 100% Design Project Plans  
 Pre-Excavation Sampling (4 Properties)  
 Conduct Pre-Construction Meetings

Mobilization  
 Excavation  
 Confirmation Sampling  
 Site Restoration  
 Excavation  
 Confirmation Sampling  
 Site Restoration  
 Excavation  
 Confirmation Sampling  
 Site Restoration  
 Excavation  
 Confirmation Sampling  
 Site Restoration  
 Pre-Final Inspection  
 Completion of Punchlist Items  
 Demobilization of Site Facilities  
 Final Inspection  
 Removal Action Complete

USEPA Mtg - Determine 45 Dust Sampling Locations  
 Dust Sampling OU1 Phase A&B Properties  
 Sample Data Consolidation  
 Sample Data Validation  
 Prepare Draft Construction Completion Report  
 USACE Review of Internal Draft CCR (Electronic)  
 CAPE Finalizes Draft CCR for Submittal  
 Submittal of Draft CCR to USEPA  
 USEPA Review of Draft CCR  
 USEPA Comments to USACE/CAPE

CAPE, INC.  
 OU-1 REMEDIAL DESIGN  
 CORNELL DUBILIER SUPERFUND SITE  
 SOUTH PLAINFIELD, NEW JERSEY

Early Bar  
 Progress Bar  
 Critical Activity

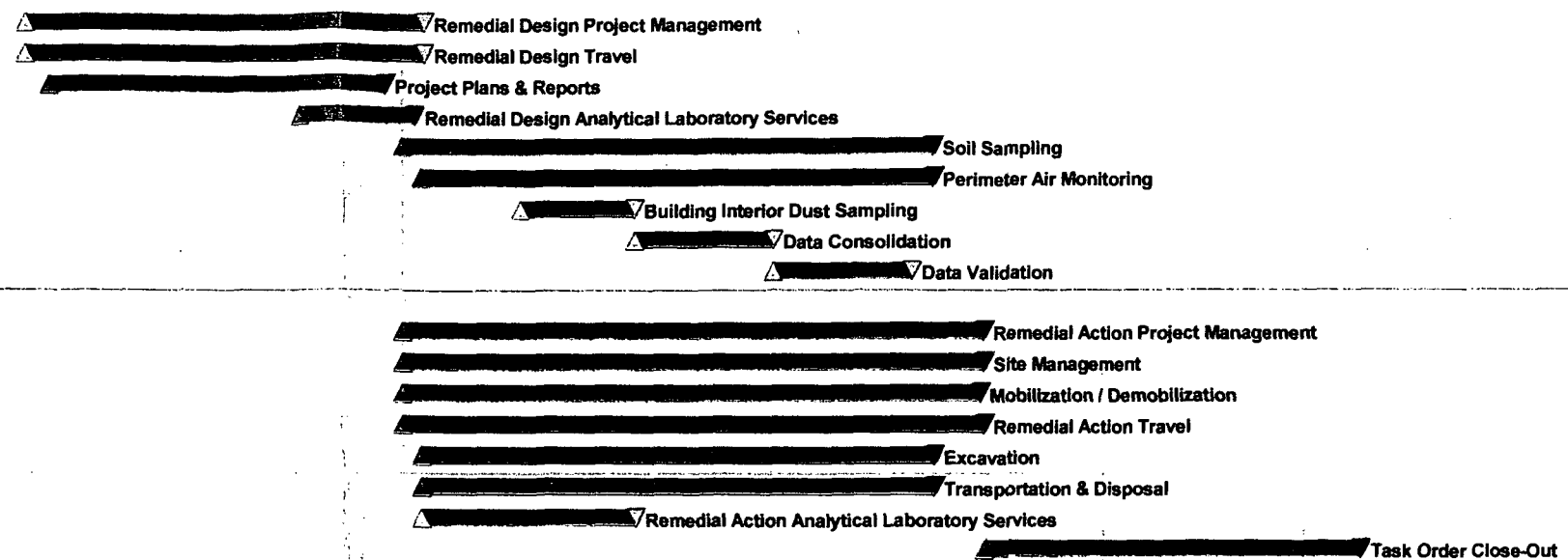
0500	Prepare RTCs to USEPA Comments	5	0	26JUL06	01AUG06	0.00
0510	USEPA Review to RTCs	5	0	02AUG06	08AUG06	0.00
0520	CCR RTC Finalization Teleconference	1	0	09AUG06	09AUG06	0.00
0530	CAPE Finalizes CCR	5	0	10AUG06	16AUG06	0.00
0540	Submit Final CCR to USEPA/USACE	1	0	17AUG06	17AUG06	0.00
0550	Remedial Action Phase Complete	0	0		17AUG06	0.00
0560	Contract Completion Date	0	0		17AUG06	0.00

- Prepare RTCs to USEPA Comments
- USEPA Review to RTCs
- CCR RTC Finalization Teleconference
- CAPE Finalizes CCR
- Submit Final CCR to USEPA/USACE
- Remedial Action Phase Complete
- Contract Completion Date

### BUDGET

#### REMEDIAL DESIGN

0570	Remedial Design Project Management	87*	0	08JUL05	07NOV05	25,049.00
0650	Remedial Design Travel	87*	0	08JUL05	07NOV05	9,836.00
0580	Project Plans & Reports	74*	0	15JUL05	26OCT05	36,656.00
0620	Remedial Design Analytical Laboratory Services	26*	0	30SEP05	04NOV05	22,441.00
0600	Soil Sampling	115*	0	01NOV05	10APR06	20,249.00
0590	Perimeter Air Monitoring	111*	0	07NOV05	10APR06	5,441.00
0610	Building Interior Dust Sampling	25*	0	07DEC05	10JAN06	8,593.00
0630	Data Consolidation	30*	0	11JAN06	21FEB06	44,399.00
0640	Data Validation	30*	0	22FEB06	04APR06	35,432.00

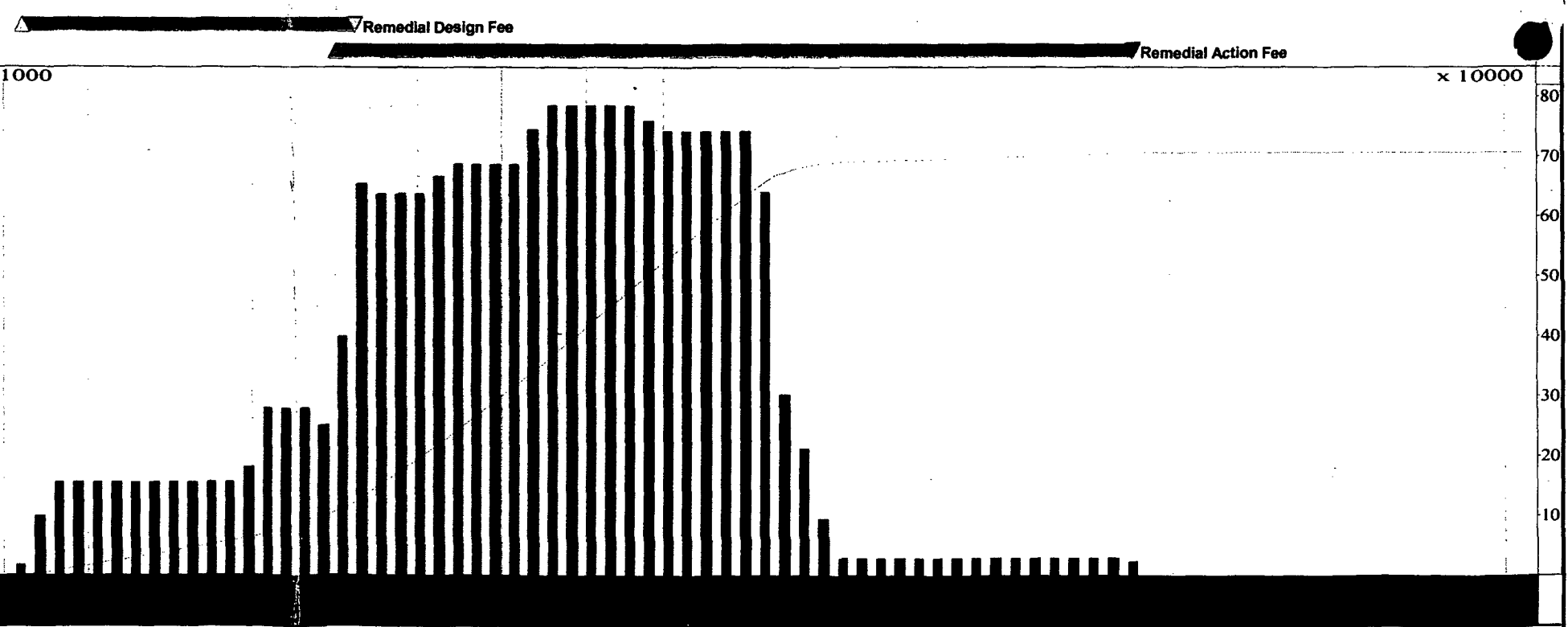


#### REMEDIAL ACTION

0660	Remedial Action Project Management	126*	0	01NOV05	25APR06	24,001.00
0670	Site Management	126*	0	01NOV05	25APR06	88,865.00
0680	Mobilization / Demobilization	125*	0	01NOV05	24APR06	29,874.00
0740	Remedial Action Travel	126*	0	01NOV05	25APR06	25,765.00
0690	Excavation	111*	0	07NOV05	10APR06	55,231.00
0700	Transportation & Disposal	111*	0	07NOV05	10APR06	128,060.00
0720	Remedial Action Analytical Laboratory Services	47*	0	07NOV05	10JAN06	20,960.00
0730	Task Order Close-Out	82*	0	26APR06	17AUG06	4,921.00

#### FEE

0750	Remedial Design Fee	87*	0	08JUL05	07NOV05	16,506.00
0760	Remedial Action Fee	208*	0	01NOV05	17AUG06	30,390.00



Resource/Cost Profile Legend

Total of All Resources  
Total early cost per Week (Current Estimate)

Current estimate curve  
Earned value curve  
Planned value curve

Detail scale (left): X 1000  
Cumulative scale (right): X 10000

Start Date 20JUN05  
Finish Date 17AUG06  
Data Date 20JUN05  
Run Date 25OCT05 16:41

CAPE, INC.  
OU-1 REMEDIAL DESIGN  
CORNELL DUBILIER SUPERFUND SITE  
SOUTH PLAINFIELD, NEW JERSEY

